

COTS

JOURNAL

The Journal of Military Electronics & Computing

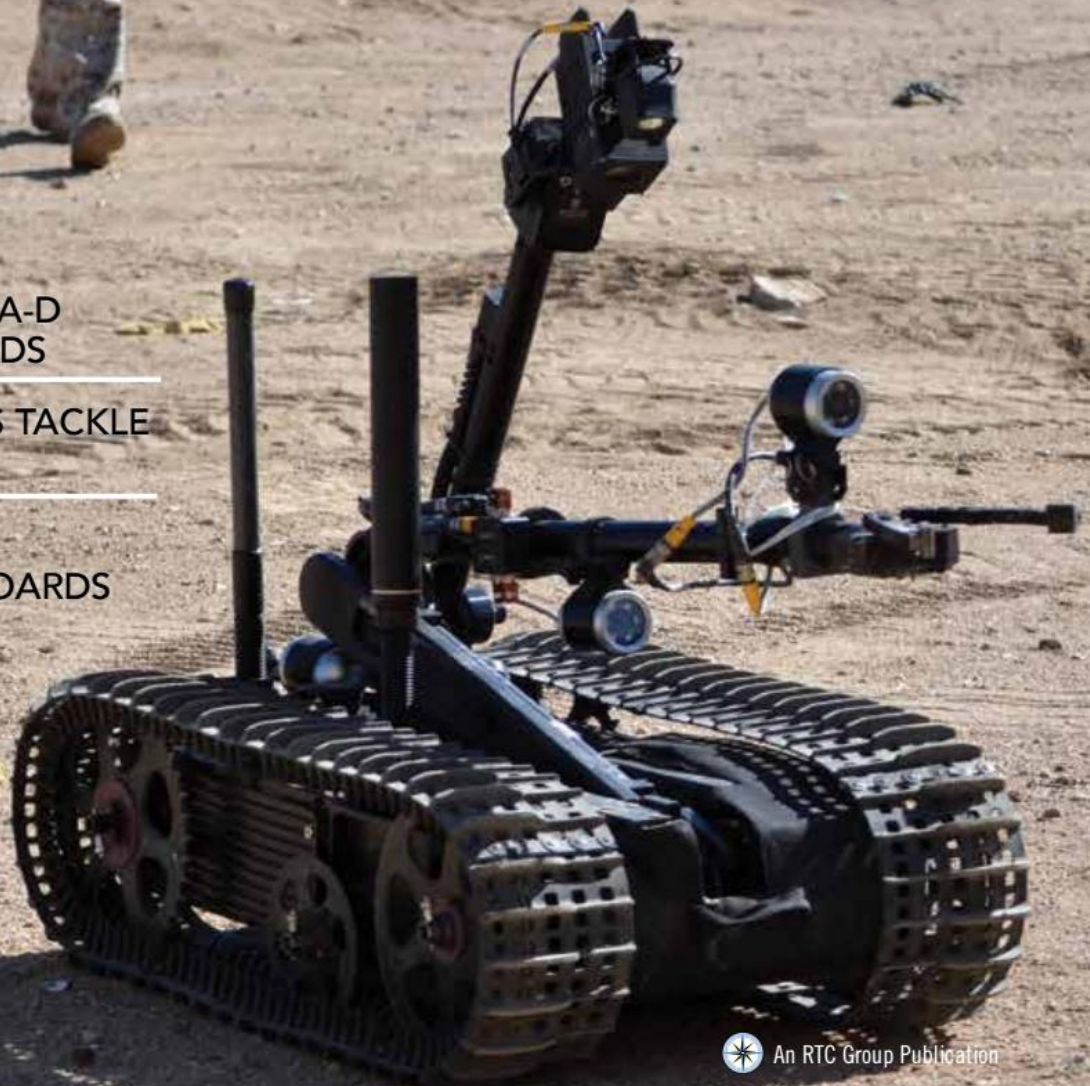
Connectivity Upgrades Lead UAV & UGV Trends

JEFF'S PICKS

JEFF'S TOP D-A and A-D
CONVERSION BOARDS

FPGA INNOVATIONS TACKLE
SECURITY ISSUES

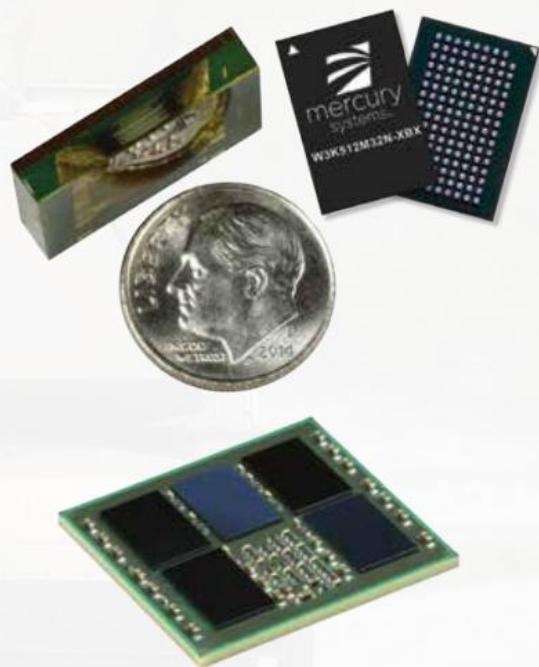
DATA SHEET:
ITX AND MINI-ITX BOARDS



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CONTENTS

April 2017 Volume 19 Number 4

FEATURED p.10 Interconnectivity is Theme for UAV and UGV Tech Advances

SPECIAL FEATURE

Embedded Computing Choices for UAVs and UGVs

- 10 **Interconnectivity is Theme for UAV and UGV Tech Advances**
Jeff Child
- 16 **Embedded Computing Enables Smaller, Smarter UAV Designs**
Joe Eicher, Kontron

TECH RECON

Jeff Child's Top D-A and A-D Conversion Boards

- 20 **A-D Processing Board Family Boasts Scalable, Flexible Architecture**
Jeff Child

SYSTEM DEVELOPMENT

FPGAs Solve Defense Challenges

- 24 **FPGA Advances Offer Both Capabilities and Challenges**
J Ryan Kenny, Intel PSG (Altera)

DATA SHEET

ITX and Mini ITX Boards Roundup

- 28 **Mini-ITX and Pico-ITX Boards Boast Leading Edge Graphics**
Jeff Child
- 29 **ITX and Mini ITX Boards Roundup**

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

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

DEPARTMENTS

- 6 **Editorial**
I'm Big on Better Buying
- 8 **The Inside Track**
- 33 **COTS Products**
- 42 **Marching to the Numbers**

Coming in May
See Page 40

On The Cover: Reserve component Sailors assigned to Explosive Ordnance Disposal Operational Support Unit (EODOSU) 7 use a Man Transportable Robot System "Talon" Mark 2 to approach a suspected bomb maker's building during a mobility exercise at Naval Air Weapons Station China Lake. (U.S. Navy photo by MSCS 2nd Class Joshua Scott).



Editorial

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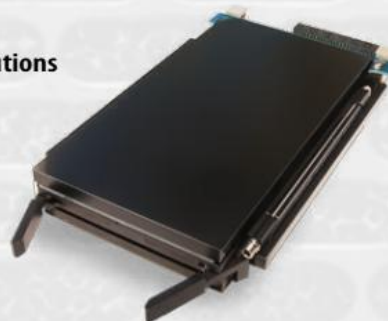


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EDITORIAL

Jeff Child, Editor-in-Chief

I'm Big on Better Buying

On “normal” years the DoD has consistently released its Budget Proposal for the next fiscal year in February, but this year the next fiscal year proposal isn’t expected until May. To be fair, when there’s been a change in Administrations such delays are not uncommon. As we look ahead, it’s interesting to take a look at the DoD’s spending and efficiency performance over the past year.

Along just those lines, the GAO recently released its annual “Quick Look” report across the DoD’s weapons programs. The DoD is investing more than \$1.4 trillion to acquire 78 major weapon systems—including aircraft, ships, and ground vehicles. The GAO found that the Department had made strides to address past inefficiencies. Certain programs, for example, increased their buying power by \$10.7 billion. “Buying power” means more can be purchased for the same level of funding. All that said, the DoD, according to the report is missing key opportunities to reduce cost by increasing competition. The report also cited how most weapon programs it assessed are not yet fully following knowledge-based best practices—increasing risk for cost increases and delays.

Since the GAO’s 2016 assessment, the number of programs in the DoD portfolio of major defense acquisitions decreased from 79 to 78, while DoD’s planned investment over the life of these programs increased by \$9.4 billion to \$1.46 trillion. That included mixed performance in the portfolio this year. While the current portfolio has incurred \$484 billion in total cost growth, \$476 billion of this occurred 5 or more years ago suggesting that recent performance has improved.

Interestingly, 60 percent of the total cost growth occurred after programs entered production, when costs should be more stable. But the portfolio increased its buying power by \$10.7 billion, meaning DoD can buy more goods or services for the same level of funding. This gain resulted from some programs finding procurement efficiencies that more than offset inefficiencies in other programs. The report says the 19 newest programs decreased their costs by a combined \$3.4 billion over the past year.

The execution of key reform initiatives GAO analyzed for the 45 current and 9 future programs it assessed this year was similar or slightly less as compared to its 2016 assessment. These initiatives address program and portfolio affordability, cost growth controls, and competition use. For example, 42 programs this year reported conducting “should-cost” analyses, which are designed to reduce programs’ costs by identifying and eliminating inefficiencies. Programs can take a variety of actions, such as reducing overhead, to do so.

The weapons programs that did “should-cost” analyses reported realizing \$23.6 billion in savings. A similar number of programs reported establishing affordability constraints, which programs use to set priorities and inform what they can and cannot afford. GAO found that current programs with established affordability constraints had a lower average amount of cost growth from initial estimates compared to programs without a constraint.

Another key reform initiative looked at was the fostering of competitive environments in acquisition. According to the GAO report progress there is stagnant: more programs this year reported having no plans for competition before or after development start. The report also said that 31 current programs reported that they are scheduled to complete the evaluation of their potential cyber vulnerabilities by 2019, required by the 2016 fiscal year National Defense Authorization Act.

Most of the programs GAO assessed this year are not yet fully following a knowledge-based acquisition approach. Of the four programs that recently entered system development, only one completed all of the applicable GAO criteria for a best practices approach. Three of the four implemented some knowledge-based practices such as completing a system-level preliminary design review before development start. Meanwhile, other practices—such as fully maturing technologies prior to system development start and completing systems engineering reviews—were not fully implemented. That all adds up to programs carrying unwanted risk into later phases of acquisition that could result in cost growth or schedule delays.

The report cited how several programs are concurrently conducting software and hardware development during production and claims that exposing programs to undue cost and schedule risk. From my point of view, that point is a mixed bag. We live in an era when developing software and hardware simultaneously is smart and efficient if organizations leverage the right tools and techniques while also embracing open standard hardware architectures. When done right it’s how projects stay on schedule. On the whole, it’s good to see progress being made in the defense acquisition process. In the DoD’s comments on the report there is agreement with GAO’s findings with DoD affirming that these results validate its focus on continuous program improvements. Let’s hope that as spending goes bigger, buying habits will keep getting better. ■

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The INSIDE TRACK

Navy Contracts Textron Systems for Two Common Unmanned Surface Vehicles

Textron Systems Unmanned Systems has announced today that it has received a \$14.8 million contract to provide two additional fourth-generation CUSV vehicles for the U.S. Navy's Unmanned Influence Sweep System (UISS) program. The U.S. Navy intends to use these two CUSV systems as part of their comprehensive Mine Counter Measure Unmanned Surface Vehicle (MCM USV) mission, which includes mine-hunting and potentially mine-neutralization, as well as mine-sweeping. These two additional CUSVs will join the U.S. Navy's first CUSV, which is designed for the influence sweeping mission.

The CUSV is a multi-mission

unmanned surface vehicle, capable of carrying multiple payloads, including side-scan sonar, mine neutralization, nonlethal weapons, and intelligence, surveillance and reconnaissance (ISR) sensors (Figure 1). Since its first demonstration in 2009, the CUSV has successfully completed several prominent exercises with the U.S. Navy. Today, the variations of the CUSV have amassed more than 2,000 on-water operational hours. Delivery of the two CUSV systems is expected in 2018.

*Textron Systems
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Figure 1

The CUSV is a multi-mission unmanned surface vehicle, capable of carrying multiple payloads, including side-scan sonar, mine neutralization, nonlethal weapons, and ISR sensors.

PICMG Ratifies COM Express Revision 3.0 for Server Grade Performance

PICMG has announced the release of a high-performance revision that adds server-grade functionality to COM Express embedded computing systems. Revision 3.0 of COM Express provides for a new Type 7 connector and the addition of up to four 10 Gigabit Ethernet (10GbE) interfaces on the board (Figure 2). Previous revisions of the specification were limited to a single Gbit Ethernet interface. The higher speed ports open up new markets such as data centers where the high compute density of COM Express can result in increased rack utilization. The 10GbE ports are also ideal for high bandwidth video applications such as surveillance.

Another change to the specification includes increasing the



Figure 2

Shown here is an example COM Express Rev. 3 configuration of 4x 10GBASE-KR through Fiber PHY/ Copper PHY to SFP+/RJ45.

number of PCI Express lanes to 32 across the Type 7 connector. This provides a wealth of connectivity and interface options including the ability to facilitate the use of GPGPUs. According to Jeff Munch, Chief Technology Officer for ADLINK and the Chair of the COM0 R.3 Committee, the Revision 3.0 positions COM Express for the future while maintaining backwards compati-

bility. PICMG continues to advance new technologies and upgrades to existing specifications.

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ViaSat Taps McObject's Database Tech for Satellite Ground Network

McObject has announced that ViaSat has chosen eXtremeDB in order to implement a new physical layer satellite debugging application known as the Data Metric Aggregation System (DMAS) project. DMAS ingests metrics feeds from satellite ground-system elements at a very high rate and conducts analysis of the data to identify trends and abnormalities to help enhance network speed, quality and reliability. Today approxi-

mately 1 million metric entries per second are captured from the ViaSat ground system using eXtremeDB.

Using eXtremeDB, it's expected that DMAS, will significantly improve the flow rate, performance and quality of the metrics data. Analytics performed on the DMAS data can then be leveraged across market segments and geographic regions of the ViaSat network. ViaSat expects to see a significant increase in metric volumes and flow rates once the ViaSat-2 and ViaSat-3 satellites are launched. According to McObject, ViaSat selected eXtremeDB after a stringent review process because of its scalability; performance and its confidence in McObject's ability to offer a solid support team.

*McObject
Federal Way, WA.
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The INSIDE TRACK

U.S. Army Awards BAE Systems \$112 Million Contract for M88 Support

BAE Systems has received a contract worth up to \$112 million from the U.S. Army to perform technical support and sustainment of M88 recovery vehicles. The contract, awarded by the Army's TA-COM Life Cycle Management Command, is for ongoing service and improvements to BAE Systems-built M88A1 and M88A2 recovery vehicles over the next four years. The M88 vehicle provides recovery support to troops in the field, and is the only vehicle able to recover the M1 Abrams tank and all of the vehicles required to maneuver with the Armored Brigade Combat Team during battle (Figure 3).

Under the contract, called Systems Technical Support and Sustainment Systems Technical Support, services and products will be delivered to the Army, the U.S. Marine Corps, and Foreign Military Sales customers in support of their 70-plus ton combat vehicle recovery requirements. Work on the program will be performed by the current workforce at the company's facilities in San Jose, CA; York, PA; and Sterling Heights, MI; as well as by field service representatives stationed at military facilities across the globe.

*BAE Systems
McLean, VA
(703) 847-5820
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Figure 3

The M88 vehicle provides recovery support to troops and is the only vehicle able to recover the M1 Abrams tank and other Armored Brigade Combat Team vehicles during battle.

Inventus Power Granted Patent for Primary Conformable Soldier Wearable Battery

Inventus Power recently announced the issuance of Patent Number 9,564,761 B2 by the United States Patent Office. The patent covers a Primary Conformable Wearable Battery (P-CWB) with removable command module. The P-CWB is a non-rechargeable version of the 148Wh Conformal Wearable Battery (CWB150). It was developed in partnership with the U.S. Army and aims to consolidate soldier equipment and increase energy independence. The battery pack enables soldiers to carry a consolidated power unit with reduced weight, improved user ergonomics and fail-safe characteristics.

According to the company, the modern soldier carries several mobile electronic devices that require a significant number and variety of batteries in the field. Although

innovative technology like wearable computing can increase soldiers' capabilities, the increase in weight can conversely hinder mobility and add to fatigue. Inventus Power's CWB products provide soldiers with a safer, ergonomic, centralized power solution that reduces weight and the overall number of batteries needed for a mission. Soldiers can rely on power for up to 72 hours without having to recharge or replace battery packs.

The Primary Conformal Wearable Battery (P-CWB) was designed to complement the rechargeable 150Wh Conformal Wearable Battery (CWB150) by improving the safety, comfort, and maneuverability of the warfighter. The P-CWB integrates easily with standard uniform and armor configurations and eliminates the need to carry bulky, block

shaped batteries. The P-CWB provides an ergonomically favorable alternative to the 5590 Primary Battery while still incorporating all of the features required for safety in MIL-PRF-32271. The command module houses the majority of electronics and is removable and reusable with other core packs within a battery matrix (Figure 4).

Because the primary battery pack is disposable, overall user load may be reduced with each battery discharged and discarded, ultimately increasing user gear capacity and overall mobility. This patented technology is being applied in the Inventus Power P-CWB battery, which utilizes LiMnO₂ cells, operates at 15 V, provides over 195 W-hour capacity, and exceeds the 5590 from a safety and performance

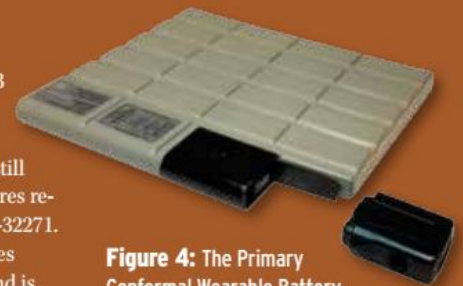


Figure 4: The Primary Conformal Wearable Battery (P-CWB) has a command module houses the majority of electronics and is removable and reusable with other core packs within a battery matrix.

perspective. The command module monitors and controls battery discharging, voltage output, and current output.

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SPECIAL FEATURE

Embedded Computing Choices for UAVs and UGVs





Interconnectivity is Theme for UAV and UGV Tech Advances

Unmanned systems both air- and ground-based continue to depend on powerful processing technology. The latest trend is toward communications and network advances among systems.

Jeff Child, Editor-in-Chief

It's clear that both unmanned aerial vehicles (UAVs) and unmanned ground vehicles (UGVs) have evolved to become indispensable tools for today's modern warfighter. Their technology trends have likewise following a parallel path. Both UAVs and UGV system designs are moving toward more autonomous capabilities and ever more sophisticated ISR collecting. All that requires increased embedded compute density. To keep pace, the embedded computing industry is responding with highly integrated, small form factor solutions serving the needs of UAVs and UGVs.

On UAV side, development in recent years has trended toward upgrades of existing UAV platforms and payloads while limiting development of new ones. Technology vendors have responded with new integrated box-level systems with the proper size, weight and power (SWaP) for UAV requirements. For medium and large UAVs, most system upgrades are aimed at either adding more payload functionality in the same space or at adding more separate payloads on the same platform. The consolidation of multiple systems into few boxes is impacting the radar, imaging processing and communications capabilities of next-gen UAVs.

SPECIAL FEATURE

For UGVs, system platforms have matured significantly since operations in Iraq and Afghanistan began. Over that period, the DoD has acquired and deployed thousands of UGVs and support equipment. The systems support a diverse range of duties, everything from suspected object identification and route clearance to locating and defusing improvised explosive devices (IEDs). Over the last 12 months, a lot of the advances in both UGVs and UAVs has centered on communication between unmanned platforms and warfighters and between the systems themselves. This includes everything from sharing video data to adding radio functionality.

Radio Comms for UGVs

In an example along those lines, last summer Endeavor Robotics (formerly iRobot) and Persistent Systems teamed up to integrate the MPU5, a communication system, into Endeavor Robotics' family of battle-proven ground robots (Figure 1). The integration of the Wave Relay network helps warfighters by significantly increasing the distance of unmanned ground operations and enabling operators to control or observe multiple robot assets through a common controller interface over the Wave Relay MANET.

According to Endeavor Robotics, the first generation of tactical robots used limited range point-to-point radios constrained by frequency, transmit power and nominal mesh capabilities. Today both robot systems and radio technology have evolved to enable greater capabilities and more secure and expandable communications between single systems or networks of down range systems. With the integration of advanced radio solutions such as Persistent Systems' Wave Relay MANET technology lets operators of Endeavor robots establish and relay communications between multiple robots. It also provides them personnel views of real-time video and telemetry feeds from all robots within the MANET.

Modular UGV Platform

In January QinetiQ North America (QNA) likewise forged a deal Persistent Systems to ingrate MANET radios into its TALON and Dragon Runner ground robots.



Figure 1

The 310 SUGV from Endeavor Robotics is a man-portable robot intended for gathering data for situational awareness in critical conditions.

The MANET relay radio can connect QNA's ground robot family with a reliable, high throughput, and long range MANET communication system that is self-forming, self-healing, and scalable. QNA has begun accepting orders for MPU5-equipped Talon V systems.

When it comes to new UGV designs, among QinetiQ North America's latest offerings is the Titan developed with partner Milrem and introduced at the 2016 Association of the United States Army (AUSA) show last fall. The UGV that combines Milrem's THeMIS (Tracked Hybrid Modular Infantry System) with QinetiQ North America's robotic control technology. THeMIS is the first fully modular hybrid unmanned ground vehicle made for military applications. QNA's control technology includes the Tactical Robot Controller (TRC) and Robotic Appliqué Kit (RAK). According to QNA, this joint both meets and exceeds, the rigorous SMET program requirements. The multi-mission Titan can perform complex and hazardous tasks on the battlefield that are currently performed by soldiers.

Datalink Gear for Predator B

Shifting gears to UAV technology, communications and connectivity are also leading themes. Along those lines, General Atomics Aeronautical Systems, Inc.

(GA-ASI) last summer completed a successful demo of its Network Centric Communications Pod (NCCP) communicating via data link between UAV and U.S. Marine Corps (USMC) ground and air forces. The demo was performed during an exercise held at Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms, Calif.

The NCCP was integrated aboard a GA-ASI-owned Predator B Block 5 (Figure 2) and operated by a company-owned Block 30 Ground Control Station (GCS), NCCP provided Adaptive Networking Wideband Waveform (ANW2) retransmissions and Tactical Targeting Network Technology (TTNT) availability while simultaneously providing C-band Remote Operational Video Enhanced Receiver (ROVER) Full-motion Video (FMV) to advantaged users who possessed highly sophisticated connectivity and communications equipment, as well as disadvantaged users on the battlefield who were equipped with Kinetic Integrated Low-cost Software Integrated Tactical Combat Handheld (KILSWITCH) tablets.

During the demonstration, warfighters access enhanced situational awareness through the expansion of their ANW2 and TTNT networks. This greatly improved their ability to communicate and share information in a network that included both an airborne node and ground users. Preda-



Figure 2

The Network Centric Communications Pod (NCCP) is shown here was integrated aboard a GA-ASI-owned Predator B Block 5. It provides Adaptive Networking Wideband Waveform (ANW2) retransmissions.

tor B also provided live FMV to warfighters' ROVER, and the NCCP demonstrated the ability to stream FMV via ANW2 to USMC KILSWITCH tablets. This data, along with imagery captured by GA-ASI's Lynx Multi-Mode Radar, was transmitted to Camp Pendleton's Battle Simulation Center and displayed on GA-ASI's Claw 3 Integrated Sensor Payload Control and Analysis Software system, as well as GA-ASI's System for Tactical Archival, Retrieval, and Exploitation (STARE) workstations.

Swarms of Gremlin UAVs

In another communications-related UAV developed, GA-ASI last month announced that DARPA has continued to contract the company for Phase 2 of the Gremlins program. The Gremlins program seeks to develop innovative technologies and systems enabling aircraft to launch volleys of low-cost, reusable Unmanned Aircraft Systems (UAS) and safely and reliably retrieve them in mid-air. Such systems, or "gremlins," would be deployed with a mixture of mission payloads capable of generating a variety of effects in a distributed and coordinated manner, providing U.S. forces with improved operational flexibility at a lower cost than is possible with conventional platforms.

GA-ASI was awarded a contract for Phase 1 of the program in March 2016. While Phase 1 was conceptual in nature, Phase 2 aims to mature the design and perform in-flight risk reduction testing for the C-130-based recovery system. Activities will include Preliminary Design Review (PDR) for the aircraft and recovery system, ground testing to validate key technologies,

and flight test to demonstrate safety and recovery system performance. The program is expected to culminate in an air launch and recovery demonstration in 2019. The Gremlin aircraft is one in a line of new Small UAS (SUAS) being developed by GA-ASI. The vehicle is capable of one-hour time-on-station at a range of 300 nautical miles while carrying a modular 60-pound payload.

MQ-4C Triton Achieves Milestone C

Moving up to Large UAV platforms, the U.S. Navy's "new" MQ-4C Triton UAV last fall obtained positive Milestone C low-rate initial production approval. The decision marked the beginning of the production and deployment phase of the DoD acquisition process. The test team analyzed and validated sensor imagery and performance at different altitudes and ranges. The aircraft system's ability to classify targets and disseminate critical data was also examined as part of the OA testing. Successful evaluation of Triton's time on station confirmed that it will meet flight duration requirements. Triton also transferred full motion video to a P-8A Poseidon in flight, proving a key capability to significantly enhance its ability to detect, track, classify and identify maritime threats (Figure 3).

For its part, the RQ-4 Global Hawk also



Figure 3

A MQ-4C Triton UAV test proved it can transfer full motion video to a P-8A Poseidon in flight, proving its enhanced ability to detect, track, classify and identify maritime threats.

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SPECIAL FEATURE



Figure 4

The Avionics ROCK-2A features interoperable processing, graphics and I/O building blocks to provide all the functions required for modern C4ISR and avionics applications.

made news last fall when Northrop Grumman successfully flew an Optical Bar Camera broad-area synoptic sensor on an RQ-4 Global Hawk. That marked the first time the legacy U.S. Air Force camera has been flown on a high altitude unmanned aircraft. The Optical Bar Camera has provided panoramic and unalterable imagery. Existing models of the U.S Air Force Global Hawk are capable of carrying an Enhanced Integrated Sensor Suite (EISS), Airborne Signals Intelligence Payload (ASIP) and Multi-Platform Radar Technology Insertion Program (MP-RTIP).

Avionics-Centric Box-Level Solution

The trend toward COTS box-level systems being integrated onto to UAVs isn't new. The twist over the last few years is towards box-level systems with function-specific features tailored to airborne applications—like UAVs. Exemplifying this trend is Mercury's Avionics ROCK-2A—a development platform for conduction-cooled boards used in the ROCK-2 series of pre-integrated processing subsystems (Figure 4). The development platform's front-panel is populated with commercial connectors for easy accessibility from test and devel-

opment benches. Both the hardware and software are identical across the ROCK-2 development (ROCK-2A) and rugged airborne (ROCK-2B/C) platforms, enabling UAV system developers to migrate from one platform to the other without modification.

The ROCK-2 series uses Mercury's Avionics Series of interoperable processing, graphics and I/O building blocks to provide all the functions required for modern C4ISR and avionics applications. Avionics ROCK-2A includes a software package with all the development tools required to build an application right out of the box. The board support package integrates all the drivers required for VxWorks 653. Other operating systems, with Linux and VxWorks available soon. The system's front-panel and underlying I/O board are designed for customization enabling application specific I/O interconnects to be quickly implemented. Interfaces are provided for ARINC 429 Tx/Rx for high and low speed; Dual redundant MIL-STD-1553; RS232/422/485 configurable serial channels; Fast Ethernet, Gbit Ethernet, USB, Discrete I/O along with digital and/or analog video inputs. ■

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Embedded Computing Choices for UAVs and UGVs

Embedded Computing Enables Smaller, Smarter UAV Designs

Highly integrated, embedded technologies with low SWaP are giving UAV system developers an expanding set of options with which they can meet upcoming challenges.

Joe Eicher, Defense Global Business Development
Kontron

The Department of Defense 2017 budget request illustrates that the military shows no signs of backing away from advancing their unmanned vehicle programs. This comes from the success of manned-unmanned defense teaming that has proven these programs to be highly successful in helping military operations become more agile, responsive and safe. From the Air Force and Army to the Marines and Navy, all branches are looking to add more

air, sea and land unmanned systems, including smaller and smarter ones to their arsenal.

The diverse and complex nature of UAV designs and the integrated computing systems inside pose some of the most difficult design challenges for developers (Figure 1). The complexity and functionality of these systems grows with each new generation or upgrade, where each must satisfy a varied list of requirements that continually test the

limits of embedded computing technologies all within strict budget guidelines and tight program deadlines.

Embedded Computing Solutions

Continuing advancements in open architecture COTS embedded computing are helping to drive UAV system innovation. Even though every UAV design has a defined set of requirements, they do share the need for characteristics that are common benefits delivered by COTS-based computing platforms. Namely these are the ability to provide ever higher processing performance, interoperability, scalability, adherence to strict size, weight and power (SWaP) restrictions and cost-effective long-term availability.

In fact, last year the Pentagon continued its search for next-generation warfighting technologies. They invited technology companies to offer concepts that solve problems in key areas including better methods to manage and use the massive amounts of data generated by the sensors deployed in UAV operations.

Multi-core Computing Capabilities

Sophisticated UAV sensor payloads are important additions enabling military personnel to acquire a wealth of data, including streaming video and high-definition (HD) images. Added to this equation, bandwidth



Figure 1

The diverse and complex nature of UAV designs and the integrated computing systems inside them pose difficult design challenges for developers.



Figure 2

The VX3058 SBC is based on the advanced 8-core version of the Intel Xeon Processor D architecture. It enables designers to solve diverse set of computing problems such as advanced imaging or sensor processing for unmanned systems.

is often limited, and can prevent the transmission, sharing, and display of this type of mission-critical information. Such network limitations are driving the need for efficient data processing directly on the UAV system. If designers are to rely on embedded computing platforms to support new UAV operational needs, they must deliver exceptional computational performance.

Meeting these needs are the latest multi-core COTS platforms that supply the necessary dual data plane 10 gigabit Ethernet (GbE) network bandwidth along with the powerful processing capabilities of parallel virtual machine (VM) execution. High performance COTS solutions also meet the need for a highly-networked UAV infrastructure that will enable any unmanned system to be accessed on the network to facilitate continuing communications to control personnel. Having all vehicles networked ensures there is a ready datalink to transmit captured vision, radar or sensor information.

Multi-core platform features also deliver the capability to consolidate different workloads and applications onto a single system. From available high performance 8-core boards and systems based on the Intel Xeon Processor-D, these embedded computing solutions can easily handle increased broadband connectivity needs while supporting other operational capabilities in

tandem.

Developers could foreseeably segregate and combine applications on a single system giving command and control personnel access to varying sensor data analytics. It is increasingly important to be able to segregate authorization-based data before it is transmitted to an open-source ground system to protect classified sections. This can be accomplished while also providing other necessary tasks such as vehicle control or monitoring fuel consumption.

Multi-core based platforms give UAV developers the features to enable extensive capital and operational efficiencies to be achieved using isolated workloads, which dynamically share common resources. Plus, the virtualization capabilities provided by Intel processors means that a single application design can be easily adapted to hardware evolution needs such as CPU core count, memory, form factor and I/O availability future-proofing the embedded computing solution investment. Figure 2 shows an example multi-core board suited for UAV platforms (Figure 2).

Interoperability and Re-Use

Operational efficiency under tight budget limitations is driving the crucial requirement that the airframes and ground/water unmanned designs perform more than just

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one function or role. This broader role takes in a variety of mission objects beyond just surveillance. To meet Department of Defense mandates for more cost-effective re-use of unmanned vehicles, OEMs are taking a common design approach that employ standard interfaces and interoperable, 'plug and play' payloads as opposed to developing multiple types of systems that only do one or two tasks.

Designing for this diverse role requires implementing interoperability with increased computing and communications capabilities to meet greater real-time operational control needs. Unmanned systems are also required to be compatible with ground stations and other systems besides those in the vehicle itself. That means interoperability in embedded platforms must extend to cover multiple functions such as payload sensors for camera and radar systems as well as those monitoring temperature, biological, electro-



Figure 3

The COM-based COBALT system's sealed housing makes a critical difference in applicability for unmanned applications while delivering valuable options for customized IO.

magnetic and chemical threats.

That is where COTS embedded computing platforms as VPX and Computer-on-Modules (COMs) shine. They offer proven interoperability and re-use from an open systems architecture that can support the wide range of hardware and software capabilities that are continually being released from an expanding ecosystem of suppliers. Using advanced open architecture hardware solutions not only provides the interoperability required but also high-level security features that are critical for command-and-control center communications. In addition, standards-based, COTS solutions are also inherently scalable to support various vehicle payload objectives and future application upgrades.

Satisfying these needs is the latest COMs from Kontron. The COMe-bKL6 module offers both high-performance (from a broad range of CPUs) and integrated Intel HD Graphics that can support up to three independent displays with up to 4k resolution, enabling UAV developers to match their operational requirements. These new modules also feature brand-new Intel Optane technology, a non-volatile memory solution based on 3D XPoint memory technology. It works up to 1,000 times faster than a NAND flash memory to massively reduce latencies, which is a strong advantage in high-performance computing or image processing UAV scenarios.

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Rugged SWaP Options

All the technological advancements integrated into today's unmanned systems are worthless unless they are rugged enough to operate with the utmost reliability in intense environmental conditions. In addition, almost all UAV designs have exacting rugged SWaP requirements. Therefore, developers struggle with the need to package a high level of computing power and data collection/distribution components into their space-constrained designs that also must be ruggedized. Hand-in-hand with harsh environments is the careful consideration of thermal load and system efficiencies to maximize battery life that result in the highest operational availability.

To provide consistently reliable performance, COTS platforms must be made up of a rugged baseboard, power module, housing and appropriate I/O connectors. These defined ruggedized components also need efficient thermal management for limited SWaP requirements. An example system along those lines is Kontron's small form factor Computer-on-Module (COMs)-based COBALT system meets these needs for UAV designs. Its sealed housing makes a critical difference in COBALT's applicability for unmanned applications providing a proven rugged, highly reliable system that maximizes performance and feature capabilities while delivering valuable options for customized IO (Figure 3).

Driving Autonomous Operation

The military is initiating new UAV programs that call for compute intensive on-board intelligence that can provide the ability to make real-time mission adjustments leading to greater levels of autonomous operation. This highlights the expected evolution of UAV deployments and the need for embedded computing solutions to deliver the increased levels of connectivity in highly interoperable standards-based platforms. Offering the technology to accomplish this convergence of capabilities allows military operations to be better integrated with other battlefield applications.

Deep learning is a method to process very large data sets. From deep learning algorithms, UAV designers need to handle thousands of levels of processing layers

and non-linear transforms in order to make sense of information or patterns from enormous amounts of data. Deep learning can be successfully applied for on-platform processing of streaming signal or image data. These systems would have to have the capability to sift through voluminous streams of data to locate threats and autonomously deploy active protection systems.

Up until now, the processing power needed for such complex applications was not small and low-power enough to integrate into embedded computing solutions suitable for UAV systems. By supplying the required algorithms mapped onto the computing architecture, the latest HPEC platforms provide the fast backplane performance desired in a much smaller footprint. A HPEC platform example for deep learning is one based on the aforementioned Intel Xeon Processor D-1540.

Each of the processor's 16 cores has two AVX2 units and each unit can process 8 floating point FMA operations at a time. Offering a huge amount of processing power, the 16 cores one can perform 512 floating point operations with each clock cycle making it for a wide range of deep learning applications. These types of HPEC systems are well-suited for VPX-based boards and platforms that can deliver high-speed/low-latency communication via the backplane with PCIe Gen3 or 10Gbit Ethernet links.

Taking UAV Designs into the Future

Advanced COTS-based platforms meet the combat system requirements for reduced lifecycle costs due to their interoperability and modularity, improved communications capabilities and the ability to support complex integration of a variety of hardware and software solutions. Supporting "leap ahead" UAV payload, autonomy, communications, sensor or imaging capabilities expected in future programs, embedded computing platforms based on the latest multi-core processors are delivering the massive processing performance needed to handle highly differentiated workloads while minimizing SWaP.

Available in a variety of form factors and based on existing MIL standards, today's COTS solutions support the need for a common UAV architecture. Open architecture computing is the foundation to increase

an unmanned program's value by enabling the use of enhanced sensor capabilities or intelligent payloads combined with the ability to change or update any of these based on specific mission profiles. Today's embedded computing platforms not only support modular plug-and-play payload capabilities that expand UAV combat roles, their standards-based and scalable technologies help developers quickly adapt UAV designs in response changing threats. ■

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www.kontron.com*



Jeff Child, Editor-in-Chief

JEFF'S PICKS

A-D Processing Board Family Boasts Scalable, Flexible Architecture

Today's military digital conversation application rely heavily on analog-to-digital converters (ADCs), digital-to-analogy converters and FPGAs. The evolving trend in recent years is to perform digital conversion as soon along the signal chain as possible. High-bandwidth A/D converters with high sampling rates must connect to extremely fast data transfer paths to store and process data with triggering or gating circuitry to digitize pulse waveforms at precisely the right time. To feed those needs, board vendors continue to push the barriers with solutions with ever faster ADCs and more sophisticated FPGAs. A rich selection of digital receiver products combine ADCs and FPGAs on one VME, VPX, or PCI Express board. Other solutions pair a FPGA processing engine with mezzanine-based ADCs using form-factors like FMC or XMC.

For this month's Jeff's Picks section COTS Journal evaluated several ADC and DAC conversion products based on three aspects: technology leadership, design innovation and market relevance. The winning product is the PVP-7xx family of A-D processing boards from Star Communications (Figure 1). This family is scalable from 1 to 4 A/D channels and from 1 to 4 FPGAs (Xilinx high-end Virtex-7 XC7VX485T). According to the company, the product is based on a small, multi-channel A-D component that uses high-speed serial links to route sample data to FPGAs on the board.

Each HSSL link consists of a differential pair operating up to 4 Gbits/s, and protected using SONET scrambling and Hamming error correcting codes. Use of HSSL has several PCB



Figure 1

Jeff's Pick is the PVP-7xx family of A-D processing boards from Star Communications. It's scalable from 1 to 4 A/D channels and from 1 to 4 FPGAs (Xilinx high-end Virtex-7 XC7VX485T). Programmable sample rates provide flexibility.

design benefits. First, board area is minimized because each differential pair replaces an entire data bus. Second, routing is simplified because careful length matching of large data busses and their clocks is not needed. Finally, the HSSL is directly compatible with Giga-bit transceivers available on Xilinx Virtex-7 FPGAs. This makes it easy to route all sample data to every FPGA installed on the board.

Flexible, Programable Design

The PVP features a programmable sample rate, based on a clock generator IC manufactured by Analog Devices. Design benefits include small footprint, flexible referencing options, and a low-phase noise sample clock with programmable frequency. Total board area devoted to clock generation is only 22 x 30 cm. An onboard frequency reference is included having ± 2.5 ppm stability over time, frequency, and

temperature. Alternatively, customers can supply an external reference anywhere from 1 PPS to 250 MHz in a variety of formats. The board automatically recognizes and switches to the external reference if present. Using the selected reference, the sample clock can be programmed anywhere between 100 MHz to 250 MHz in sub-Hertz steps.

The technology and design innovations result in an A-D product that is small yet very flexible. Flexibility allows the product to support a common architecture that can acquire and process data at the edge of multiple systems. This in turn provides the usual benefits of a common architecture, including scalability, code re-use, common operating procedures, and reduced logistic support. A single board can handle up to four receive channels the intermediate frequency (IF) design allows multiple RF on one board. Front-end bandwidth allows multiple IFs simultaneously—for example 70 and 140 MHz. The board's programmable sample rate allows users to choose their IF frequency. And the sample rate can be chosen so that it relates to one's final application which means less filtering is needed. Sample data is synchronized across all receive channels and FPGAs. And because the architecture is scalable, users can scale from one to four FPGAs to scale processing capability to match what's required. ■

Star Communications
Vienna, VA
(703) 254-5860
www.starcommva.com

8-Channel A/D XMC Provides Radar Phased-Array Solution

Pentek's Model 71131 is an eight-channel, 250 MHz XMC module featuring 16-bit A/Ds with programmable multiband digital down converters (DDCs) (Figure 2). It's a member of Pentek's Jade family of high-performance data converter XMC modules based on the Xilinx Kintex Ultrascale FPGA. The board is suitable for connection to HF or IF ports of a communications or radar system. Its built-in data capture feature offers an ideal turnkey solution as well as a platform for developing and deploying custom FPGA-processing IP. The eight channels make it especially beneficial for multi-channel phased array platforms in defense and weather radar applications where the cost per channel can be substantially reduced.

The front end accepts eight analog HF or IF inputs on front panel MMCX connectors with transformer coupling into four Texas Instruments AD-S42LB69 dual 250 MHz, 16-bit A/D converters. The Model 71131 features eight A/D Acquisition IP Modules for easily capturing and moving data. Pentek's Navigator Design Suite was designed from the ground up to work with Pentek's Jade architecture and Xilinx's Vivado Design Suite. The Navigator Design Suite consists of two components: Navigator FDK (FPGA Design Kit) for integrating custom IP into Pentek sourced designs and Navigator BSP (Board Support Package) for creating host applications.

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

FMC Offers Four ADCs, Two DACs and High SNR Performance

Innovative Integration's FMC-SDF is an FMC module that features four 24-bit, ADCs and two, 18-bit DACs, each simultaneously-sampling and DC-accurate (Figure 3). These ultra-high resolution, sigma-delta devices support high dynamic range applications such as stimulus-response, ATE, and seismic data acquisition. Ultra-low jitter clock and trigger controls provide ultimate analog fidelity coupled with precisely framed acquisition and playback. Captures may be triggered via software or external LVCMOS edges.

The FMC-SDF power consumption is under 15 W for typical operation. The module may be conduction cooled using a VITA20 standard heat-spreader. The product may be conformal coated and ruggedized for wide-temperature operation from -40 to +85 degrees C operation and exposure to 0.1 g²/Hz vibration. Support logic in VHDL is provided for Innovative's broad line of FPGA-accelerated FMC carriers. The Framework Logic package supports development under Xilinx Vivado using VHDL or HLS (high-level synthesis). Additionally, the Matlab BSP within the Framework supports real-time hardware-in-the-loop development using the graphical block-diagram Simulink environment and Xilinx System Generator.

*Innovative Integration
Simi Valley, CA
(805) 578-4260
www.innovative-dsp.com*



Figure 2

The Model 71131 is an eight-channel, 250 MHz XMC module featuring 16-bit A/Ds with programmable multiband digital down converters (DDCs).

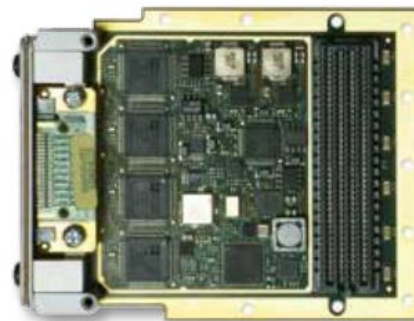


Figure 3

FMC-SDF is an FMC module that features four 24-bit, ADCs and two, 18-bit DACs, each simultaneously-sampling and DC-accurate. The high res, sigma-delta devices support high dynamic range applications.

Check Out These D-A and A-D Conversion Boards Too...

The **FMC121** from **Abaco Systems** (formerly 4DSP) provides two 16-bit A/D channels up to 1Gsp/s and two 16-bit D/A channels up to 1.4 Gsp/s data rate with a 2.8 GSPS update rate. The design is based on TI's ADS54J60 A-D and DAC39J84 D-A converters.

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

Acromag's AP220 module from its **AcroPack series** is a 12-bit DAC Module with 16 channels voltage outputs and wide temperature range. When used with a carrier that holds two AcroPack AP modules, up to 32 voltage outputs can be obtained from a single card cage slot.

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

The **XRM2-ADC-D9** from **Alpha Data** is an I/O Module which provides two Analog to Digital converters with 14-bit resolution at sampling rates up to 500MHz. The XRM is aimed at IF/Baseband Signal Sampling applications.

*Alpha Data
Denver, CO
(303) 954-8768
www.alpha-data.com*

The **WWQA05** from **Annapolis Micro Systems** is a Quad 500 Msamples/s 16-Bit ADC WFMC+. It has four input bandwidth options, internal sample clock options and internal 10MHz reference clock options. The board is compatible with any WILDSTAR mainboard with a WFMC+ slot.

*Annapolis Micro Systems
Annapolis, MD
(410) 841-2514
www.annpmicro.com*

The **CHAMP-WB-A25G** is a board set from **Curtiss-Wright** that couples the dense processing resources of a single large Xilinx Virtex-7 FPGA with a high-bandwidth 25 Gsample/s 8-bit ADC module in a commercial grade 6U OpenVPX (VITA 65) form factor module.

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

The **Echotek Series DCM-V6-XMC Module** from **Mercury Systems**

combines the latest wideband high-performance ADC with a high-speed, high-resolution DAC, both working in conjunction with Xilinx Virtex-6 technology. The 12-bit ADC samples at up to 3.6 GSPS.

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

Vadatech's VPX599 provides dual-channel ADC with sample rates of up to 6.4 GSPS at 12-bits and a dual DAC update rate of up to 12 GSPS and direct RF synthesis at 6 GSPS at 16-bits making it suitable for signal capture/analysis applications such as COMINT, SIGINT and radar.

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FPGAs Solve Defense Challenges

FPGA Advances Offer Both Capabilities and Challenges

As FPGAs migrate to roles as “System Chips” they contain ever more valuable defense sensitive data and engineering. Keeping those resources safe and secure raises challenging issues.

J Ryan Kenny Strategic and Technical Marketing Manager
Intel PSG (Altera)

Countless articles in *COTS Journal* and other publications highlight the importance, applications, and the success of Field Programmable Gate Arrays (FPGAs) in defense programs. The FPGAs themselves have changed dramatically in ways that augment this success. Advances include the addition of Digital Signal Processing (DSP) blocks, memory resources, high speed data protocol support, extended temperature range support, hardened processors (SoCs), and security features.

The latest generation of 16nm and 14nm products are expanding these inroads even further. The leading FPGA developers have aggressively developed products on the newest silicon manufacturing technologies. That’s driven by the aggregation of applications they can accommodate on a single FPGA platform. These leading-edge technologies then compete economically with ASICs, ASSPs, and other technologies for the limited volumes of many defense applications. In contrast, new custom ASICs entail exponentially increasing NRE expenses on leading silicon technology nodes that are otherwise amortized across different markets and users with FPGA products.

Attractive FPGA Features

The radar and electronic warfare applications of FPGA DSP blocks have been extensively documented by users and providers of

FPGA technology. New features for military applications in recent product offerings include the hardening of single precision floating point operations and design/synthesis tool support for hardened floating point. That allows for higher resolution beam forming and image deconstruction and the ability to exploit the higher resolution analog-to-digital converters available in the market (Figure 1).

The combination of more sophisticated security architectures, and the promise of do-

mestic fabrication, also ensure that a trusted FPGA product can be provided to the defense market.

Some vendors also provide application-focused reference designs and tailored development kits useful for defense and government applications. When combined with DSP-oriented design tools and high level synthesis code support and compilers, FPGAs become attractive for performance reasons but also development time and cost reasons.

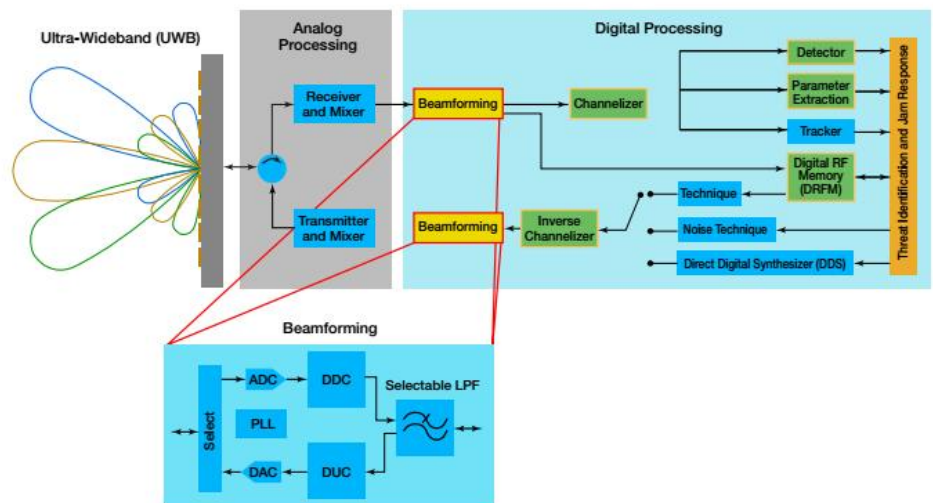


Figure 1

Hardened floating point features on FPGAs enable higher resolution beam forming and image deconstruction.

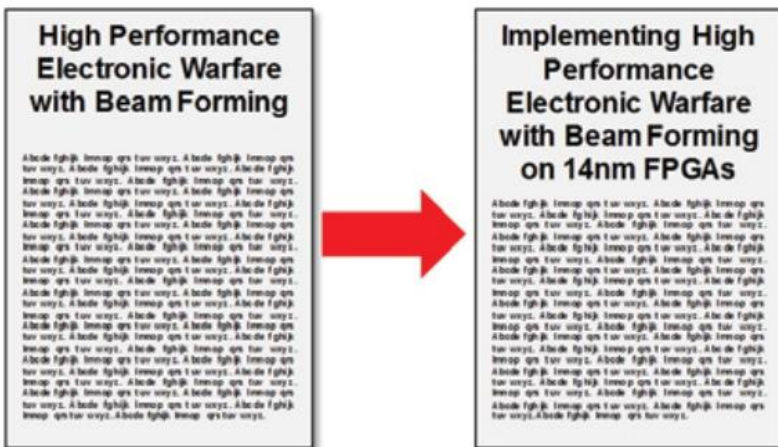


Figure 2

Defense sensitive information resides not only in the algorithms themselves but also in the engineering knowledge of how those algorithms are implemented on an FPGA.

Finally, multi-die integration technology from multiple vendors has enabled the capability for mixed circuit technology in a single package. That reduces chip-to-chip latencies while reducing the physical security footprint of the overall solution. All that adds up to solutions with in-package memory, analog-to-digital converters, and other solutions for applications like electronic warfare where processing time requirements and latency sensitivities are critical to performance.

Example FPGA Breakthroughs

One of the primary technologies enabled by high performance and high density FPGAs is classical beam forming and signal processing. Programmable logic is well-suited for customizing digital beam steering and concentration capabilities. That serves the needs of high performance sensors and jammers, and more recently enables wireless communication infrastructures with the advent of the 5G standard.

Another more recent breakthrough is the capability to perform artificial intelligence or machine learning applications on a single chip or small number of chips. Doing that requires either a massive tailored ASIC development or high density FPGA to conduct the wide parallelization of convolutional neural networks or other technology for use in targeting automation and image recognition.

In any of those scenarios, the 'defense application sensitive' data is typically an al-

gorithm that is implemented in the software of a commercial FPGA product. However, the breakthrough performance of these defense applications is highly dependent on the component technology and novel multi-die commercial products, and sometimes on the design and optimization tools used and intellectual property blocks leveraged. That means the defense application itself, as well as its implementation on commercial technology both need protecting.

Defense Sensitive Technologies

For years, many of the more sophisticated defense sensor and processing technologies have taken advantage of the raw computing power of workhorses like FPGAs, GPUs, embedded processors, and high speed memories. As these heterogeneous computing applications are moved into smaller form factors, multi-die chips, and more tightly coupled configurations the interest from the defense sector has only grown. The enabling technologies, in some instances, become the forces of 'silicon convergence' and highly capable systems-on-chip. As a consequence, defense sensitive information lies not only in the algorithms themselves but also in the engineering knowledge of how those algorithms are implemented across multiple electronic components (Figure 2). This 'know how' is a combined effort between defense developers and commercial chip vendors.

Systems integration, and getting mul-

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SYSTEM DEVELOPMENT

tiple small components to work together in a low latency environment, is an enormously difficult technical task—arguably the most important activity in defense development today. It often entails technical support from one or more component providers. And even more support is needed when there are multiple electronic components from a single vendor in a design. FPGAs and SoCs are by

their nature complicated devices, and defense customers develop very complex systems using these technologies. Abstracting the sensitive defense application from a customer support engagement likewise enters a new realm of complexity.

Protecting Sensitive Technologies

Companies like Intel as commercial pro-



Figure 3

Sensitive information handling policy and procedures make up the first level of an overall information protection strategy.

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viders of semiconductor technology to the Department of Defense need to recognize these new complexities, and be proactive in protecting the defense sensitive information of customers. While there will always be tailored processes for each defense engagement as required by the U.S. Government, it is important that a common set of data handling procedures be identified for classifying, marking, and handling defense customer information—both for data protection and data audit purposes (Figure 3).

It is likewise important that we handle and separate information in such a way that commercial technologies like FPGAs remain commercial and dual-use, both for economic viability as well as the ability to take advantage of all breakthroughs in the commercial semiconductor industry. It has been well over 20 years now that the Department of Defense recognized and mandated the use of commercial technology in defense systems, and this responsibility includes making sure that these technologies remain in the commercial marketplace.

The types of data involved in supporting a customer engagement can include a variety of things. This can include specifics of customer requirements, including numbers of channels and data rates that may reveal radio frequency technologies elsewhere in the system. This can include customer schematics and board layouts, typically attended by an FPGA or semiconductor applications en-

gineer to ensure correct power tree design and pin assignments. It can also include specific debug support requests in a bug tracking system that can reveal operations aspects of a defense system. And of course, this type of data can also include whole or partial source code of a design provided for benchmarking and debug purposes.

Information Handling Procedures

In order to responsibly supply the defense electronics market, it is the responsibility of commercial technology providers to offer strong data handling procedures for the protection of defense technology. This includes, but is not limited to, supplier-user agreements on document marking and classification when design information is exchanged or reviewed. Clear audit trails should apply not only to exchanged information, but also to the service request processes and what consultation occurred during these service requests. Finally, well-defined checklists should be used when deciding exactly what defense customer

design information makes its way into the data networks of commercial providers, and when such information should not be transferred at all. Throughout, human resources and program management tracking should ensure that only US citizens or persons are utilized when conducting support activities of defense systems.

Providers of defense systems need to operate in safe and controlled environments in order to protect leading edge military capabilities. And high performance silicon providers need to operate in fast-paced, agile, and high communication environments capable of maintaining a competitive edge. Information needs to be treated very differently in these two environments, and so the transfer of information between these environments requires regulation and control. At the same time, creating extremely high performance multi-die solutions and design software requires more transfer of application information than ever before.

At the end of the day, all these additional data handling procedures should

have the goal in mind of making commercial technologies acceptable, economical, and most importantly, safe to use in defense system designs. Technology trends and package level integration create far more technical support data than ever before. All that makes data controls more important than it's ever been. Now is the time to define, communicate, and implement design data handling rules for all designers and users of FPGAs for defense systems. ■

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VS.



Mini-ITX and Pico-ITX Boards Boast Leading Edge Graphics

Products based on the various small sized versions of the ITX form factor—Mini-ITX and Pico-ITX provide system developers with complete PC-functionality and advanced graphics.

Jeff Child, Editor-in-Chief

The days have now past when backplane-based form factors like VME and cPCI were only choices for military systems. Now that a complete computing solution can be designed into a small form factor embedded motherboard, system designers can opt to dispense with extra size and weight for card cages and the backplanes themselves. Among the so-called bus-less embedded form factors are the various versions of the ITX. They offer a more complete single board computer (SBC) approach, integrating most or all of the typical desktop PC kinds of functions. Military systems where graphics are a priority are particularly suited to these types of board-level products (Figure 1). Some of these products takes advantage of the latest SoC integrated with Intel Gen9 featuring seamless Ultra HD graphics and support for multiple display outputs.

The ITX form factor is based on the ATX PC motherboard standard, but it's more known in recent years its spinoffs Mini-ITX and Pico-ITX. Mini-ITX is a 17 x 17 cm (or 6.7 x 6.7 inch) low-power motherboard form factor developed by VIA Technologies in 2001. They are commonly used in small form factor (SFF) computer systems. Mini-ITX boards can be passively cooled due to their low power consumption architecture. The four mounting holes in a Mini-ITX board




Figure 1
Bus-less embedded computer form factors like Pico-ITX, Min-ITX and Thin-Mini-ITX are particularly attractive in space-constrained military applications that require advanced graphics for user interfaces.

line up with four of the holes in ATX-specification motherboards. Pico-ITX, meanwhile, is a PC motherboard form factor announced by VIA Technologies in January 2007. The form factor was transferred over to SFF-SIG in 2008. The Pico-ITX form factor specifications call for the board to be 10 x 7.2 cm (3.9 x 2.8 inch).

Mini-ITX and Pico-ITX have become so prevalent that this year *COTS Journal* gave them (this), their own Data Sheet Roundup

section. Among those, there are many vendors this year coming out with their first Thin Mini-ITX board offerings. Thin Mini-ITX is version of Mini-ITX that is only 22 mm in height, a thinner port cluster and horizontally stacked SO-DIMM memory slots. Meanwhile the 3.5-inch style of board continues to be a popular size even though it's not any official established standard. Note the product in the roundup section on the next couple pages includes only boards released in the past 12 months.

For its part, Intel provides documentation for using Thin Mini-ITX for a so-called All-In-One PC board design including the minimum requirements for consideration and approval to have components listed on its "Channel AIO Compatibility Matrix". According to Intel, compliance with those requirements ensures compatibility among the listed building block components to aid in the successful integration of Channel All-In-One systems. The business model for All-In-One system integrators is based on building block components that are readily available from established distribution channels. This compliance document is targeted towards All-In-One systems based on the Thin Mini-ITX motherboard standard as defined in the Thin Mini-ITX Based PC System Design Guide. 

ITX and Mini ITX Boards Roundup



Mini ITX Board Sports AMD Brazos G-Series Dual Core T56N APU

Acrosser Technology's AMB-A55ET1 is an industrial Mini ITX motherboard, is based on the AMD Brazos G-Series Dual Core T56N APU with AMD Hudson-E1 A55E which integrated with AMD Radeon HD 6320 and supported Directx 11. The card is equipped with 1x VGA, HDMI and LVDS connection on the rear I/O panel, as well as 2 Mini PCIe slot for mSATA/USB, and 8 USB 2.0 which can satisfy most requirements of industrial appliances. Onboard SO-DIMM socket supports up to 4 GB of DDR3 1333 memory.

- AMD Brazos Dual Core T56N APU.
- AMD Hudson-E1 A55E Fusion Control Hub.
- 1 x SO-DIMM, DDR3-1066/1333MHz up to 4 Gbytes.
- 1 x VGA, 1x HDMI, 1 x LVDS; AMD Radeon HD 6320 500MHz, Directx11 Supported.
- 8 x USB2.0; 2 x miniPCIe; 1 x COM Header; 1 x 4-Pin S/PDIF Header.
- 2 x SATA II 3Gbit/s Ports.

Acrosser USA
Cypress, CA
(714) 903-1760.
www.acrosser.com



Mini-ITX Embedded SBC Boasts Intel Gen 9 Graphics

The AmITX-SL-G from ADLINK Technology is a Mini-ITX motherboard supporting the Desktop 6th Generation Intel Core i7/i5/i3 and Pentium and Celeron Processor with Intel Q170/H110 Chipset. The AmITX-SL-G is specifically designed for customers who need high-level processing and graphics performance with a long product life solution.

- 6th/7th Gen (Skylake) Intel Core i7/i5/i3, Pentium and Celeron Desktop Processors.
- Intel Q170/H110 Chipsets.
- 32 GB dual channel DDR4 at 2133 MHz.
- Intel Gen 9 graphics, 3x DP, LVDS co-lay with eDP (opt.).
- 2x LAN, 4x COM, 2x Mini-PCIe, mSATA, PCIe x16 & PCIe x1.
- Q170: 7x USB 3.0, 4x USB 2.0; H110: 4x USB 3.0, 7x USB 2.0.
- TPM1.2; Supports Smart Embedded Management Agent (SEMA) functions.

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



Mini ITX Board Combines 6th Gen Xeon Processor and Rich I/O

The ITX-i89H0 from Arbor Solution is an industrial motherboard that includes a 6th Gen Intel Xeon processor and two DDR4 SO-DIMM sockets with ECC supporting 4th Generation DDR SDRAM as well as support for Next Generation Form Factor (NGFF or M.2) expansion cards. The board features a 170 x 170 mm Mini-ITX form factor. I/O includes one GbE PHY with Intel AMT, two DisplayPort, one eDP, one HDMI port, two NGFF connectors for SSD and wireless radio support. Interfaces for USB 3.0/2.0 and LPC connection are provided also.

- Soldered onboard 6th Gen Intel Core i3-6100E Dual-core 2.7 GHz or Xeon Processor E3-1505L V5 Quad-core 2.0 GHz (Base) / 2.8 GHz.
- Integrated Gbit Ethernet: Intel i219LM GbE PHY.
- 2 x DDR4 SO-DIMM sockets W/ECC, supporting up to 32 GB SDRAM.
- Dual DisplayPorts and one HDMI support.
- Extended operating temp: -20 to 70 degrees C.

Arbor Solution
San Jose, CA
(408) 452 8900
www.arbor-technology.com



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DATA SHEET

ITX and Mini-ITX Boards Roundup



Mini-ITX SBC Serves up 6th and 7th Gen Intel Kaby Lake Processors

The AIMB-285 from Advantech is a Mini-ITX SBC sporting the latest 7th Generation Intel Core Processor Family (formerly Kaby Lake). With the latest 7th Generation Intel Core Processor Family and Advantech's exclusive WISE-PaaS integrated IoT platform software services, the board provides advanced CPU and graphics performance, and better 4K graphics; making them well suited for wide range of defense applications.

- Supports Intel 6th and 7th Gen Core i processor (LGA1151) with Intel H110 chipset.
- Two 260-pin SO-DIMM up to 32 GB DDR4 2133 MHz SDRAM.
- Supports PCIe x 4 (Gen 3), 1 F/S miniPCIe 1 H/S miniPCIe, 4 USB 3.0 and 3 SATA III.
- Supports dual display of DP/HDMI/VGA/LVDS(optional).
- Supports TPM 1.2 / 2.0 (optional).
- Support 12V DC Input.

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



Atom-Based Mini-ITX SBC Features TDP Under 12 Watts

Built with the Intel Atom processor E3900 series, the American Portwell Technology NANO-6062 is a Nano-ITX embedded board that operates with thermal design power (TDP) under 12W for fan-less applications, but it also supports a wide industrial temperature range from -40 to 85 degrees C and a wide voltage of power input from 12V to 24V for rugged applications. Support for four USB 3.0 ports ensures fast data transmission with low-power consumption.

- Supports Intel 6th and 7th Gen Core i processor (LGA1151) with Intel H110 chipset.
- Intel Atom processor E3900 series.
- Supports DDR3L 1866/1600 SODIMM up to 8 GB.
- Supports triple display by VGA, DisplayPort and LVDS.
- Supports one M.2 socket, SATA III port, Mini PCIe and mSATA socket.
- Supports a wide -40 to 85 degrees C industrial temperature range.

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



Pico-ITX SBC Boasts 14 nm Quad-Core Apollo Lake SoC

Axiomtek's PICO312 is a palm-sized fanless Pico-ITX motherboard featuring the latest 14 nm quad-core Intel Pentium N4200 or dual-core Celeron N3350 processors. This 2.5-inch Pico-ITX embedded board features the Intel Gen9 graphics engine with dual display configurations through one LVDS and a choice of one VGA or HDMI.

- N4200 and Celeron processor N3350 (Apollo Lake SoC).
- 1 DDR3L-1867 SO-DIMM max. up to 8 GB.
- 1 USB 2.0 and 1 Gigabit LAN port.
- 1 Full-size PCI Express Mini Card slot with mSATA supported.
- Expansion connectors for I/O board (one PCIe x1 lane, LPC, SMBus, DDI, USB 3.0 and audio signals).
- Fanless yet noiseless operation.
- Wide operating temperature range supported from -20 to +60 degrees C.

*Axiomtek
City of Industry, CA
(626) 581-3232
www.axiomtek.com/us*





Thin Mini-ITX Board Features 7th Gen Intel Core U Processors

Congatec's conga-IC175 is a thin industrial-grade motherboard family featuring the new 7th Gen Intel Core U (Kaby Lake) processors. The boards feature a SIM card socket for 3G/4G or Narrow Band connectivity and first versions of the Congatec Cloud-API. The option is provided for the use of ultra-fast Intel Optane memory via M.2 connector. The motherboards ship with 4 different dual-core variants of 7th Gen Intel Core U SoC processors and have a configurable cTDP from 7.5 W to 25 W.

- 7th Generation Intel Core Mobile SOC U-Processors.
- Improved Graphics Performance with HD600 Series.
- Two SO-DIMM sockets support up to 32 Gbytes of DDR4-2133 memory.
- Ready for Intel Optane memory technology on M.2.
- 2x SATA 3.0 interfaces allow additional HDDs or SSDs to be connected.
- Wide Range Power Input 12-24 Volt.

Congatec
San Diego, CA
(858) 457-2600
www.congatec.com



Pico-ITX Board Offers Rich I/O and 7 Year Lifecycle Support

DFI Tech's BW051 is the first in the company's new product line of Pico-ITX boards featuring Atom-based SoC and ARM-based processor options. The BW051 is a Pico-ITX board with a 6th Generation Intel Atom SoC processor with up to 8 GB of DDR3L memory. The BW051 board features a SATA 3.0 interface and Mini PCIe and mSATA expansion. The available I/O on the single board computer includes 2 x COM, 1 x GbE, 2 x USB 3.0, 2 x USB 2.0, 1 x 8-bit DIO, and 1 x SMBus. There are also display ports for 1 x LVDS and 1 x VGA or HDMI. DFI Tech's board products come with standard 7-year lifecycle support

- 6th Gen Intel Atom SoC.
- 1 DDR3L SODIMM with up to 8 GB.
- 12V DC-in.
- 1 LVDS, 1 VGA/HDMI.
- Mini PCIe and mSATA expansion
- 2 x COM, 1 x GbE, 2 x USB 3.0, 2 x USB 2.0, 1 x 8-bit DIO, and 1 x SMBus.
- 7-year lifecycle support standard.

DFI Tech
Sacramento, CA
(916) 558-1234
www.dfitech.com



Thin Mini-ITX Card Delivers Geforce GPU with 384 CUDA Cores

Giada USA's MG-5200SL is a Thin Mini ITX motherboard powered with the latest 14nm sized Broadwell processors. The MG-5200SL boasts a Core i5 CPU with 3 MB Cache and speeds up to 2.7 GHz for better performance and lower power consumption. A dedicated Nvidia GT730 GPU enables powerful graphics performance, supporting 4K Ultra HD resolution and multiple displays. Rather than relying on integrated graphics solutions, the MG-5200SL uses a dedicated Geforce GT730 GPU with 384 CUDA cores for 4K Ultra HD and multi-display capability.

- Intel Broadwell Core i5-5200U CPU up to 2.7 GHz with 15W TDP.
- Dedicated GT730 GPU w/ 4K Ultra HD, multi-display, and LVDS.
- Compact Thin Mini-ITX Form factor 6.7- x 6.7- x 0.95-inches.
- Compatible with Mini ITX chassis.
- Compact but efficient brass heat pipe for heat dissipation.

Giada USA
Brea CA 92821
(714) 257-9330
www.giadatech.com



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DATA SHEET

ITX and Mini ITX Boards Roundup



Mini-ITX Blends Apollo Lake Processors and Advanced Graphics

The MI811 Mini-ITX Motherboard from iBASE Technology comes built in with the Intel 2.5 GHz Pentium QC N4200 or Celeron DC N3350 processors, both belonging to the formerly Apollo Lake processor family and using the Goldmont microarchitecture for low-power Intel SoCs. The MI811 takes advantage of the latest SoC integrated with Intel Gen9 featuring seamless Ultra HD graphics, with three display outputs including an HDMI, 2nd HDMI or DVI-D, and eDP or 24-bit dual channel LVDS.

- Intel Pentium QC N4200 at 2.5GHz or Celeron DC N3350 at 2.4G GHz onboard.
- 2x DDR3L SO-DIMM socket, Maximum: 8 GB.
- Supports HDMI, HDMI / DVI-D and eDP / 24-bit dual channel LVDS.
- 2x Intel I211-AT PCI-E Gigabit LAN.
- 4x USB 3.0, 4x USB 2.0, 4x COM, 2x SATA III.
- 1x PCI-E(1x), 1x Mini PCI-E, 1x mSATA.
- Watchdog timer, Digital I/O.

IBASE Technology
Sunnyvale, CA
(408) 992-0888
www.ibase-usa.com

Atom-Based Mini-ITX SBC Supports Three Independent Displays

The Mini-ITX embedded motherboard mITX-APL from Kontron extends the company's long-term available portfolio to include a motherboard with the latest generation Intel Atom processor (formerly codenamed 'Apollo Lake'). Supports the extended temperature range of 0 to + degrees 60 C. The mITX-APL boasts an excellent performance-per-watt ratio and optimized Thermal Design Power (TDP).

- High-performance Atom CPU, graphics, and media performance supporting up to 3 independent displays.
- TPM2.0 and built in Hardware Security Device.
- mPCIe full size, CAN bus and eMMC card; mPCIe slot which supports both mSATA or mPCIe extension target.
- SO-DIMM Sockets DDR3L-1867 Memory (up to 8 GB).
- LVDS 24Bits dual channel and Display Port 1.2.
- Extended temperature range of 0 to + degrees 60 C.

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

Mini-ITX SBC Uses Intel Skylake-S 6th Core Processor with LGA Socket

The MB-64050 from WIN Enterprises is a Mini-ITX motherboard featuring the Intel processor formerly code named Intel Skylake-S. Skylake is a 6th generation Core processor. The "S" model is a socketed processor that uses a socket called the LGA 1151 (Land Grid Array). The LGA socket provides the OEM with the flexibility to choose between Intel Core i7/i5/i3 processors, depending on the processing power required.

- LGA socketed 6th Generation Intel Core Skylake-S embedded processor.
- Intel Q170/H110 Express chipset.
- DDR4 / 2133MHz up to 16 Gbytes.
- HDMI 1.4b, DP++ and 24-bit LVDS.
- 2 x Intel GbE LAN, 1 x Mini-PCIe.
- 6 x COM, 8 x USB, LPC, SMBus.
- 4 x SATA w/ RAID, HD Audio.
- PCIe X16 and optional X1 PCIe slot.
- DC 12V input.

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



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Mini PCIe Cards Provide MIL-STD-1553 and ARINC 429 Solutions



Abaco Systems has announced the rugged R15-MPCIE MIL-STD-1553 Mini PCI Express card and RAR-MPCIE (shown) ARINC 429 Mini PCI Express card. They are ideal for harsh environments in which shock and vibration can create reliability challenges. Both units are also very small (30mm x 50.95 mm x 4.7mm) and lightweight for applications deployed in highly-constrained platforms where SWaP needs to be minimized. The R15-MPCIE supports two fully-capable dual redundant channels, giving it greater functional density than competing products. The RAR-MPCIE features eight receive and four transmit channels and can be configured to include one receive and one transmit ARINC 717 channel. Both cards also offer discrete I/O capabilities.

Both products are optimized for avionics test and simulation applications as well as field test and support, with a combination of small size and weight and powerful logging capabilities. These same attributes also make the boards ideal for small form factor mission critical systems. The API (application programming interface) for the two new products is consistent with existing

Abaco avionics products allowing customers of Abaco's broad MIL-STD-1553 and ARINC offerings to take advantage of a proven and familiar interface, and allow for the re-use of existing code for faster development, qualification and deployment.

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

3.5-inch Industrial SBC Sports 6th Gen Intel Skylake Core Processor



ADL Embedded Solutions has announced their latest high-performance industrial 3.5-inch Intel Core SBC. Based on 6th generation Intel Core Skylake processors and Intel's Q170 chipset, the ADLQ170HDS features include 32 Gbytes of DDR4 DRAM, TPM 2.0, 4x SATA 6Gb/s, 4x USB 3.0, 4x PCIe X1, and much more. This makes it ideal for a variety of industrial applications where high-performance is an absolute necessity, but no less critical are less tangible features like high MTBF, long-life availability, hardware and firmware revision control, obsolescence management, technical, engineering and design support.

*ADL Embedded Solutions
San Diego, CA
(858) 490-0597
www.adl-usa.com*

3U MicroTCA Chassis Accommodates AMC.1, AMC.2 and AMC.4



Vadatech has announced the VT884, a 3U 12-slot MicroTCA chassis that accommodates AMC.1 (ports 4 to 11), AMC.2 (ports 0 and 1) and AMC.3 (ports 2 and 3 are routed to adjacent slots). Additionally, it complies with the PICMG 3.0 Rev 3.0 and Module Management IPMI Version 2.0. The processors include fully populated High-end Virtex UltraScale XCVU440 (Xilinx), while the Extended Options and PinoutPlus can be used to support tightly-coupled networks of FPGAs. Operating temperatures are from -5 to 55 degrees C while the relative humidity 5 to 95 percent (non-condensing). Three 1100 W power supplies operate from 110-240 VAC (47-63Hz) or -36V to -75V (DC).

*Vadatech
Henderson, NV
(702) 896-3337
www.vadatech.com*

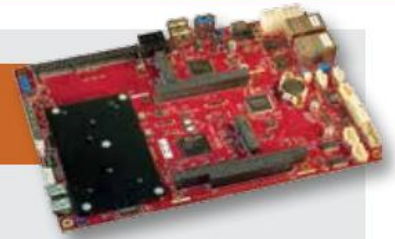
Intel Atom E38xx-based EBX SBC Provides Extended Capabilities

Versalogic has announced the "Viper", an EBX format, fanless SBC with a choice of performance level; single, dual-, and quad-core models. Compare with the "Montevina" Core 2 Duo processor, the Intel Atom E38xx-based quad-core unit can deliver twice the performance with overall power consumption of 6 watts (typical), one-third less. Two levels of security are provided. The on-board Trusted Platform Module (TPM) security chip prevents unauthorized access and the built-in AES (Advanced Encryption Standard) processor instructions adds additional protection. The target market includes defense, medical and industrial control requires protection against cyberattacks.

On-board I/O ports include a USB 3.0 port, six USB 2.0 ports, two 10/100 Ethernet, four serial ports, thirty-two digital I/O lines, eight 12-bit analog inputs and four 12-bit analog outputs. Additionally, the Dual SATA interfaces support high-capacity rotating or solid-state drives. Intel's gen 7 HD graphic processor supports two simultaneous 1080p video streams, encoding and decoding of H.264, MVC, VP8, VC1/WMV9 and other standards. Furthermore, it supports dual display support, DirectX 11, Open GL 4.0 and full HD video playback with resolution up to 2560 x 1600 at 60Hz. Video interfaces include the mini DisplayPort++ outputs, VGA and a single/dual-channel LVDS display outputs.

The unit can be expanded via its dual Mini PCIe sockets for plug-in Wi-Fi modems, GPS receivers, other mini cards (MIL-STD-1553, Ethernet, and Analog) and a microSD socket for solid-state drive (SSD). The Viper is designed for rugged applications with temperature ranges from -40 to +85 degrees C. It meets the MIL-STD-202G specifications for mechanical shock and vibration with transient voltage suppression (TVS) and electrostatic discharge (ESD) protection.

Versalogic
Tualatin, OR
(503) 747-2261
www.versalogic.com





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(510) 657-4444

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6U VPX Board Blends Xeon Processor D-1500 and TPM Security

Kontron has announced a new 6U VPX multi-processing board with Intel Xeon processor D-1500 product family Octa-Core CPUs. It is well suited for streaming radar signals, image-processing and embedded server-type applications.

Features include a dual-node architecture with 8-core 2 GHz Intel Xeon D processors, AVX2 SIMD extensions, up to 32 Gbytes of on-board soldered DDR4 (with ECC), up to 24 Mbytes of high speed cache memory and an embedded 2-D SM750 graphics controller per node.

Each VX6090's node provides dual 10 Gigabit Ethernet, two 1 Gb Ethernet controllers and M.2 slots for data storage on COTS SSD devices. In addition, SATA, USB 3.0, USB 2.0, serials and GPIOs are available on the front panel and to the rear backplane. For further I/O expansion, the VX6090 is also available with an optional XMC site. Adding advanced security, the Kontron's VX6090 integrates a TPM secure element and offers security protection with trusted boot, authentication by TPM and secure boot solutions. The board is available in Standard commercial air-cooled and in Rugged air-cooled grades.

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



Type 6 COM Express Boards Serve Up 7th Intel Core Processors

American Portwell Technology has announced the release of the PCOM-B643VG (shown) Type 6 COM Express Basic (125mm x 95mm) module, and the PCOM-B644VG Type 6 COM Express Compact (95mm x 95mm) module, developed with the 7th generation Intel Core processors (codenamed Kaby Lake). The Portwell PCOM-B643VG Type 6 COM Express module supports the 7th generation Intel Core mobile processors (codenamed Kaby Lake-H) and Intel QM175 and CM238 express chipsets; up to 32 GB DDR4-2133MT/s SDRAM on two SODIMM sockets; two DisplayPort (DP), one VGA and one LVDS output; 4x USB 3.0, 4x USB 2.0; 4x SATA3; 8x PCIe x1 and 1x PCIe x16; 1x GbE; and wide voltage support from 6V to 18V.

The PCOM-B644VG Type 6 COM Express Compact module features the 7th generation Intel Core ultra-low power processors (codenamed Kaby Lake-U); up to 32GB DDR4-2133MT/s SDRAM on two SODIMM sockets; one DisplayPort (DP), one VGA and one LVDS output; 4x USB 3.0, 4x USB 2.0; 2x SATA3, 5x PCIe x1 and 1x PCIe x4 (PEG); 1x GbE; and wide voltage support from 6V to 18V. More specifically, the PCOM-B644VG COM Express module supports up to 32 GB non-ECC DDR4 up to 2400 MHz on two 288-pin SODIMM sockets, making it faster than its predecessor.

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

HiRel Power Hybrid Product Line Targets Mil/Aero Applications

Solid State Devices, Inc. (SSDI) has announced its new HiRel Power Hybrid product line. The initial offerings are half-bridge hermetic power hybrids but will soon be followed by other families such as DC-DC converters. The line includes three new half-bridge, N-Channel MOSFET Power Hybrids, the SPH3270FP, SPH12100FP, and SPH24100FP. These hermetic devices share many key features and are ideal for high reliability applications such as motor controls, inverters, converters, robotics and so on.

The low on-resistance ratings of these devices are a key advantage, which translates into high efficiency, fast switching capabilities with lower conduction losses and cooler operation. These characteristics can potentially lower costs by reducing the number of components and heat-sinking requirements needed. In addition to the performance benefits, the high reliability of these hybrid products is exhibited by the rugged poly-Si gate, high single pulse avalanche energy rating, voltage rating, and hermetically sealed isolated packaging (flat pack, 12 pin package). Class H and K Level screening based on MIL-PRF-38534 are available. Additional requirements such as built-in Zener diode protection, gate resistor, built-in isolated / non-isolated gate drivers and anti-parallel diode for faster switching as well as other modifications can be addressed by SSDI's in-house engineering and manufacturing team.

*SSDI
La Mirada, CA
(562) 404-4474
www.ssdi-power.com*





Compact Industrial PC Series Offers Broad Industrial Interface Support

EFCO has introduced its SmartAIO U7-300 Series that offers broad industrial interface support. Based on the latest Intel Atom processors and highly-integrated Qseven CPU modules, the new EFCO SmartAIO computers are extremely compact measuring just 138 x 100 x 57 mm (5.43 x 3.93 x 2.24 inches). It is designed for maximum network interoperability offering essential gateway connectivity for today's Internet-of-Things (IoT)-ready automation applications. The systems extended application-specific interface support includes 2x Gigabit Ethernet ports, 4x USB (2x USB 3.0, 2x USB 2.0), 1x HDMI, 2x RS-232, 2xRS-232/422/485, 8-bit Isolation GPI, 8-bit Isolation GPO and Audio (1x Line-out, 1x MIC-in). In addition, EFCO can provide customized I/O modules enabling OEMs to reduce development time and costs and meet shorter customer delivery schedules.

The SmartAIO U7-300 offers wide input voltage (+9 V to +32 V) matching a diverse range of power requirements and supports industrial temperature operation from 0 to +60 degrees C. The



latest industrial PCs from EFCO are also equipped with slots for half and full-size PCI Express mini cards that can be used to support wireless functionality such as 3G/4G LTE and Bluetooth. Optional operating systems including Microsoft Windows 8 / Windows 8 embedded, Windows 7 / Windows 7 Embedded Compact or Linux are available.

*EFCO Americas
Encinitas, CA
(760) 827-8600
www.efcotec.com*

Rugged 3U VPX Xeon-D Blade Delivers Server-Grade Performance

ADLINK Technology has introduced its VPX3010 Series rugged 3U VPX processor blade with 12-core Intel Xeon Processor D-1500 SoC for server-grade computing performance. The ADLINK VPX3010 Series is SWaP-optimized and provides an extended operating temperature range of -40 to +85 degrees C. The rugged processor blade includes DDR4-2133 soldered ECC SDRAM up to 16 Gbytes; 2x 10G-KR and up to 3x 1GbE; up to PCIe x16 Gen3 interface supporting non-transparent bridge; one XMC expansion slot with PCIe x8 Gen3 with Rear I/O to P2; USB 3.0 and SATA 6 Gbits/s for high I/O throughput. The VPX3010 Series is available as both convection and conduction-cooled with conformal coating.

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



Server-grade COM Express Board Has 64 GB Memory Capacity

Advantech has announced a Type 7 COM Express Basic Module—the SOM-5992. SOM-5992 is powered by a server-grade processor with up to 16-core scalability and up to 64 Gbytes of DDR4 memory. Integrated with two 10GBASE-KR, it provides high bandwidth interfaces for data transmission and reception. The board's Intel Xeon 16-core processor is combined with a PCIe x16 and 8 PCIe x1 support Non-Transparent Bridge (NTB), which allows redundancy via PCIe. This reduces data loss, allowing a secondary system to take over PCIe storage devices if a CPU fails, and provides high availability for continuous service applications. The board supports iManager, WISE-PaaS/RMM and Embedded Software APIs.

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





Multi-Purpose Embedded System Features Two Swappable SATA HDDs

Axiomtek has announced the launch of the tBOX324-894-FL, its latest multi-functional fanless embedded computer certified with EN 50155, EN 50121, E-Mark, ISO 7637, DNV 2.4 and compliant with EN 45545-2, IEC 60945 for use in vehicle applications. It embeds 7th generation Intel Core and Celeron processors (official codename: Kaby Lake-U). The transportation box PC is equipped with two DDR4-1866/2133 SO-DIMM slots supporting up to 32 Gbytes of system memory. It is equipped with two swappable 2.5-inch SATA3 HDDs and one CFast slot. The all-in-one tBOX324-894-FL features modular I/O design allowing flexibility of different combinations: for example, with four M12 connectors or optionally four RJ-45 for GbE LANs; with three isolated COMs and one isolated CANbus; or with four isolated COM ports.

Axiomtek
City of Industry, CA
(626) 581-3232
www.axiomtek.com/us

4th Gen Core cPCI Board Provides Multiple Security Configurations

EKF Elektronik has announced the PC4-PRESTO, a 3U CompactPCI PlusIO CPU board with a 4th Generation Intel Core mobile processor (Haswell dual- or quad-core) including the i3, i5 and i7. The front panel has two Gbit Ethernet, two USB 3.0 and two Mini DisplayPort ports. Local expansion mezzanine boards (side cards) are also available. Firmware include the customizable (by EKF) Phoenix UEFI (Unified Extensible Firmware Interface) with CSM. Multiple security configurations are available including TPM 2.0 for highest level of certified platform protection and Infineon Optiga SLB 9665 cryptographic processor, conforming to the TCG 2.0 specification. RTOS supported include LynxOS, QNX, Real-Time Linux and VxWorks.

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



Rugged 4-Port USB 3.1 Hub Features Locking Connections and Extended Temp



ACCES I/O Products offers a rugged, industrial-strength, 4-port USB 3.1 hub—the USB3-104-HUB. Designed for the harshest environments, this small industrial/military grade hub features extended temperature operation (-40 to +85 degrees C), locking USB and power connections, and an industrial steel enclosure for shock and vibration mitigation. The OEM version (board only) is PC/104 sized and can easily be installed in new or existing PC/104-based systems as well. The USB3-104-HUB makes it easy to add USB-based I/O to an embedded system or to connect peripherals such as external hard drives, keyboards, GPS, wireless and more.

This versatile four port hub can be bus powered or self (externally) powered. User may choose from two power inputs (power jack and terminal block) to provide a full 900mA source at 5V on each of the downstream ports. Additionally, a wide input power option exists to accept from 7VDC to 28VDC. All type A and type B USB connections feature a locking, high retention design that complies with class 1, Div II minimum withdrawal requirements. Over 11 pounds of force (50 Newtons), is required to disconnect a cable from the type A connectors.

These connectors have a positive locking tab to quickly differentiate it from standard USB connectors. The Type B connection follows the USB3 Vision standard and features a screw lock USB cable to ensure secure connection to the USB3-104-HUB. Using the locking/latching USB connections on this hub increases reliability in your system and prevents accidental disconnection. Prices start at \$229.

ACCES I/O Products
San Diego, CA
(858) 550-9559
www.accessio.com

TCP Accelerator Platform Features Security for Ethernet Networks

Intilop has announced a full TCP and UDP Accelerator with Network Security capability which performs functions of firewall and other monitoring functions at full line rate. The full TCP/UDP Offload (TOE) Core performs Protocol Offload of all phases of TCP/IP software in High performance FPGAs, without CPU involvement. This is a major departure from the traditional TCP software.

The Security add-on module performs port filtering, blocking, monitoring and related functions in FPGA hardware at line speed thereby relieving CPU from these tasks. The Security module can be removed from the Base-TOE Core. These functions are performed in 100 nanoseconds at full 10G bps and 40G bps line rate with ultra-precision and zero jitter. In traditional systems that use TCP software for protocol processing and network security processing the CPU gets bogged down under high traffic rates specially at 10G and 40G rates, causing traffic backups and sometimes missing some 'Critical Security Events'. Fully working out-of-the-box solutions are available on Xilinx (shown) and Altera based FPPG boards. TOE, by itself can be used as a standalone solution without Security for many other network acceleration applications.

Ultra-fast and precise processing of TCP and UDP in 100 nanoseconds at 10Gbps & 40G bps that implement from 2 to 16384 TCP and UDP sessions in one single IP core sets the bar much higher for speed and performance. The TCP/UDP accelerators have a 7+ year mature and proven TCP Protocol Compliant architecture. The Security module for their latest 40G TOE is planned for Q3 2017

*Intilop
Milpitas, CA
(408) 791-6700
www.intilop.com*



NXP i.MX6-based Board Supports the Qseven Standard

DFI Tech has announced the FS700, an NXP i.MX6-based modular Qseven computer. The 1.0 GHz SoC processor operates with less than 5W of power with 1 Gbyte or 2 Gbytes of DDR3 system memory and up to 16 Gbytes of eMMC Flash memory. I/O interfaces include CANbus, RS-232, LAN, I2S, dual I2C, and 4x USB 3.0 with expandable x1 PCIe, 1x SATA 2.0 and a microSD socket. The HDMI graphics supports resolution up to 1920x1200 at 60 Hz and 2560x1600 at 60Hz (dual LVDS). Video and 2D/3D graphics are built-in. The unit is Qseven 1.2 specification compliant.



*DFI Tech
Sacramento, CA
(916) 558-1234
www.dfitech.com*

Cable Assemblies Boast Low-Smoke Zero-Halogen Performance

CDM Electronics has announced the availability of its semi-custom SAFER (Smoke and Fire Exposure Reducing) Cable Assembly Series for RF, Ethernet (RJ45), and power applications.

The low-smoke zero-halogen (LSZH) SAFER cable assemblies offer low-smoke properties that reduce the amount and density of smoke to make it easier for occupants to exit a space in the event of a fire, while their zero-halogen properties reduce toxicity and corrosivity that can harm buildings, electronic equipment, and metallic structures. They are provided standard in the most popular configurations, in lengths ranging from 1 to 25 feet, and are overmolded for added safety and durability. Assemblies meet all applicable CMR, UL/NEC, CSA and NFPA safety requirements.

*CDM Electronics
Washington Twp., NJ
(856) 740-1200
www.cdmelectronics.com*



SFF Rugged Box System Embeds Cisco Embedded Services Router

Curtiss-Wright Defense Solutions has introduced its newest multi-function computing and networking subsystem, the small form factor DuraWORX 8043. The rugged, compact system uniquely combines the power of the latest 6th gen "Skylake" Intel Xeon E3-based processor (with Error-Correcting Code memory) and Cisco 5915 Embedded Services Router (ESR) networking technology.

The DuraWORX 8043's Cisco 5915 secure router technology provides extensive security capabilities (VPN, IPS/IDS, NAT, Encryption), and information assurance validations per FIPS 140-2 and Common Criteria. Leveraging ubiquitous Cisco Systems enterprise networking infrastructure, the DuraWORX 8043 extends Cisco IOS beyond the reach of traditional fixed networks into mobile and embedded systems applications. Its advanced network security features include extensive IPv4/IPv6 routing protocols, firewall and intrusion detection functionality, and encryption (AES/NSA Suite B). Remote VoIP phone services and Mobile Ad Hoc network (MANET) routing for on-demand network connectivity to UHF/VHF/Wi-Fi/tactical radio platforms are also supported.

The dual-use (commercial and military) DuraWORX 8043 is an ITAR-free LRU. It's designed to stringent MIL and commercial aerospace standards including MIL-STD-810G, MIL-STD-461G, MIL-STD-1275D, MIL-STD-704F and RTCA/DO-160G conditions for environmental, power and EMI compliance. The unit includes a military-grade power supply that supports aircraft (MIL-STD-704F, DO-160G) and ground vehicle (MIL-STD-1275D) voltages with capabilities for optional 50/200 ms power hold-up and N+1 failover redundancy. For graphics-intensive applications, the unit supports OpenGL on its integrated Intel Iris Pro Graphics GPU. It also supports OpenCL, providing up to 640 Gflops of performance and its powerful Advanced Vector Extensions are available to accelerate math-intensive algorithms.

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



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Index

Company	Page#	Website	Company	Page#	Website
Adder.....	39	www.adder.com	Pentek.....	44	www.pentek.com
Aitech.....	23	www.rugged.com	Phoenix International.....	4	www.phenxint.com
Critical I/O.....	15	www.criticalio.com	Pico Electronics, Inc.....	17	www.picoelectronics.com
Dawn VME.....	34	www.dawnvme.com	Pixus Technologies.....	26	www.pixustechnologies.com
Horizon Display.....	25	www.horizondisplay.com	Star Communications Inc.....	18	www.starcommva.com
Intelligent Systems Source.....	27	www.intelligentsystemssource.com	SynQor.....	7	www.synqor.com
Mercury Systems, Inc.....	2	www.mrcy.com	VPT.....	14	www.vptpower.com
North Atlantic Industries, Inc.....	43	www.naii.com	WinSystems.....	5	www.winsystems.com
One Stop Systems.....	41	www.onestopsystems.com			

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COTS JOURNAL COMING NEXT MONTH

Security, Anti-Tamper and Trusted System Issues

There's perhaps no richer topic these days than that of developing secure systems. The issues are many: How do you prevent intrusions by hackers? How to best encrypt that data once an intruder gets in? How do you ensure the chips themselves haven't been tampered with—or will be tampered with? This section takes a look at the key technology, tools and products aimed at security, anti-tamper and trusted system design.

Tech Recon Jeff's Picks: Jeff Child's Top Video Processing Boards and Systems

In our popular "Jeff's Pick" section we directly leverage Jeff's decades of experience covering the embedded computing and defense market. He will choose the top products in a different category each month and share his insights on why they're significant in terms of design innovation, market relevance and technology leadership. May's section looks at video processing boards and systems.

System Development: DoD Budget Report: Major Weapons Programs

The new Administration is late this year putting out their DoD budget request for fiscal year 2018. Instead of the normal February, it's expected to be released just in time for our May coverage. Most predict the budget proposal to include more money, more programs and more modernization. This section shifts through the plans for the DoD's major military programs and what the opportunities are for embedded computing and electronics technologies.

Data Sheet: VME and CompactPCI SBCs for Tech Refresh Roundup

VME and CompactPCI do extremely well in technology refresh programs. 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. Many vendors roll out new VME SBCs each year. The rate has dropped for CompactPCI SBCs, so this year we've merged them into this VME roundup. A product album showcases representative VME and cPCI SBC products.

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COTS Journal's MARCHING TO THE NUMBERS

\$30 MILLION

Value of contract to Orbital ATK by the U.S. Army Contracting Command on behalf of the U.S. Navy for first article test and production of the MK419 Mod 1 Multi-Function Fuze (MFF). The MFF increases the overall mission capability of 5-inch gun ammunition used on U.S. Navy ships by combining five modes of operation into a single fuze. The MK419 MFF-equipped round gives a 1980s-era, single-dimension Naval Surface Fire Support munition more modern, multi-dimension capability. This includes support against multiple threats. The MFF is designed for use on the MK187 projectile used on U.S. Navy guns.



\$12.70 BILLION

Forecasted value of the remote weapon station market is projected to reach by 2022 at a CAGR of 12.47 percent during

the forecast period according to a new research report published by ASDReports.com. The market was valued at \$6.28 Billion in 2016. The report covers the Remote Weapon Station Market by Application (Military, Homeland Security), Platform (Land-based, Airborne, Naval), Component, Weapon Caliber, Mobility, Technology & Region. The growth can be attributed to the increasing incidences of armed conflicts, war, and terrorism, which are driving the demand for remote weapon stations globally.



400 HOURS

Number of flight hours the CH-53K King Stallion helicopter passed well before Lockheed Martin successfully passed its Defense Acquisition Board (DAB) review and achieved a Milestone C decision that enables low rate initial production funding for the program.

Numerous, successfully completed pre-requisites preceded the Milestone C decision. The October 2016 initial Operational Assessment by the USMC fully established the ability of the King Stallion to achieve critical mission flight and ground scenarios in the hands of active duty Marines. The CH-53K King Stallion provides three times the lift heavy lift capability of the CH-53E that it replaces.



1.5 MONTHS

The reduced manufacturing lead time Lockheed Martin Space Systems is able to achieve using a 3D-printed part aboard U.S. Air Force's sixth Advanced Extremely High Frequency (AEHF-6). The 3-D printed is a Remote Interface Unit, an aluminum electronic enclosure designed to hold avionic circuits. It will be the first 3-D printed part certified for use on a Lockheed Martin military satellite. By going from multiple machined parts to one 3-D printed part, the team was able to save time in the design and production cycle, as well as increase the quality and consistency of the units. Assembly time is also being reduced from 12 hours to just three hours.

10,000

The number of combat missions completed by the Battlefield Airborne Communications Node (BACN). BACN is developed, operated, and maintained by Northrop Grumman for the U.S. Air Force connecting warfighters in the air and on the ground. BACN is a high-altitude, airborne gateway that translates and distributes voice communications, video, imagery and other battlespace information from numerous sources. BACN bridges and extends communications among disparate users and different datalink networks. The BACN fleet comprises four E-11A manned systems and three Northrop Grumman EQ-4B Block 20 Global Hawk unmanned aircraft systems. BACN supports missions executed in Southwest Asia and reached the 10,000 combat mission milestone, March 6, 2017.



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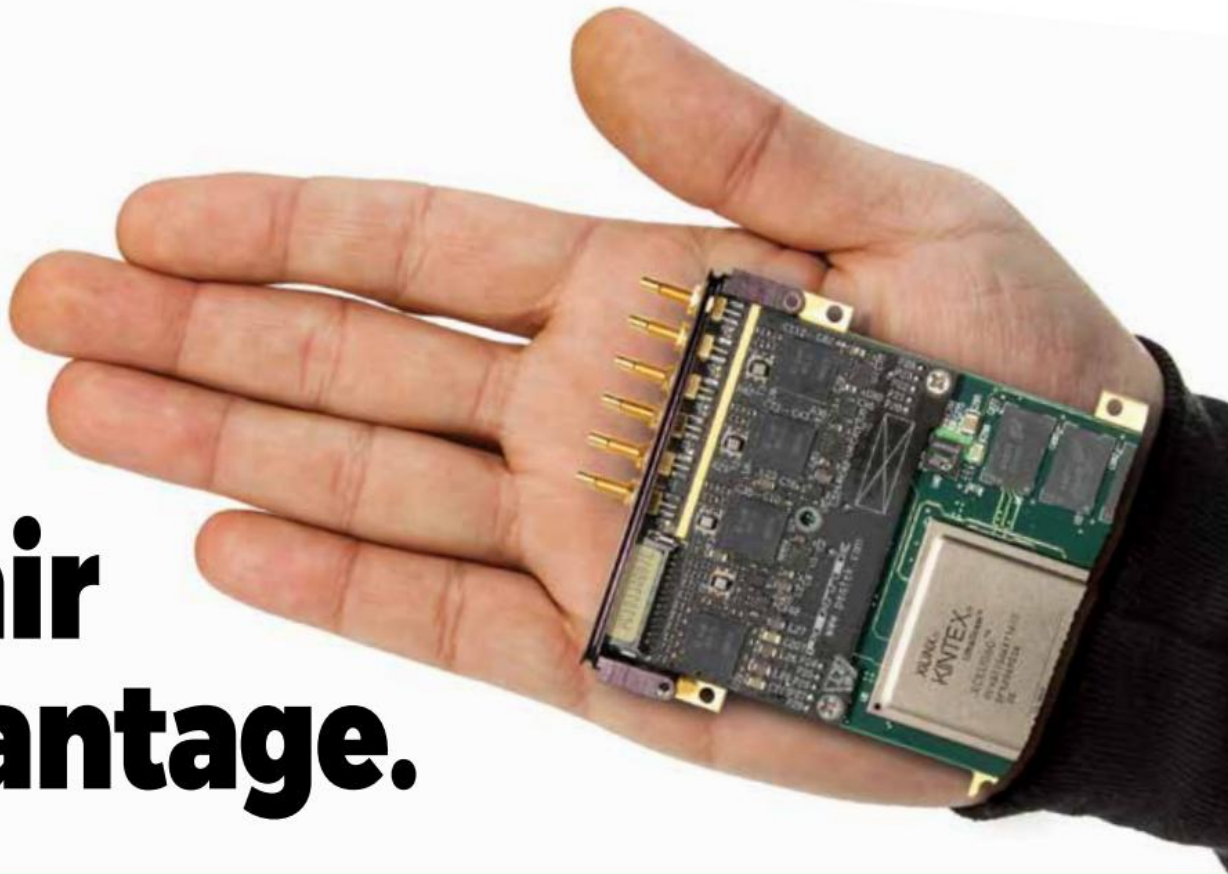


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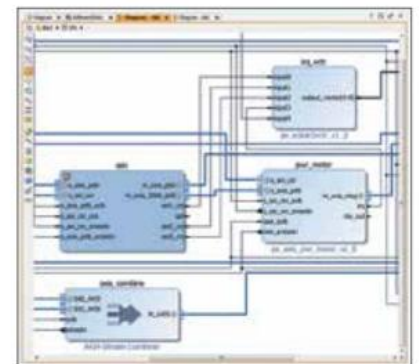
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