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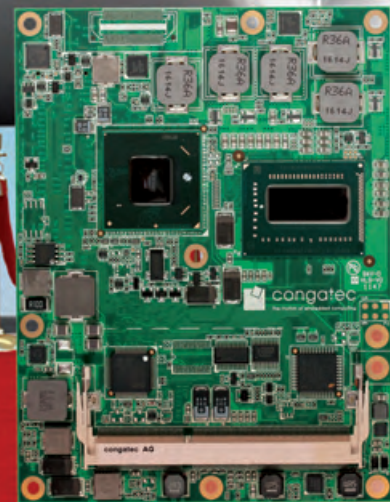
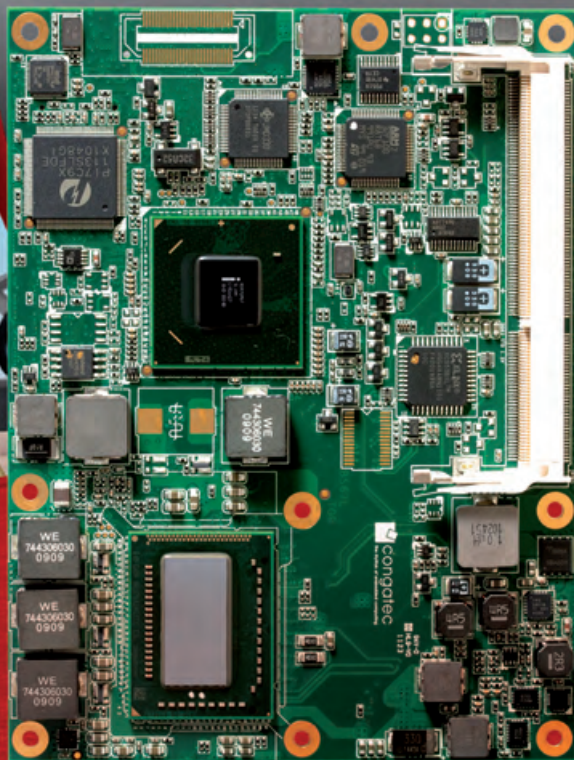
COVER STORY

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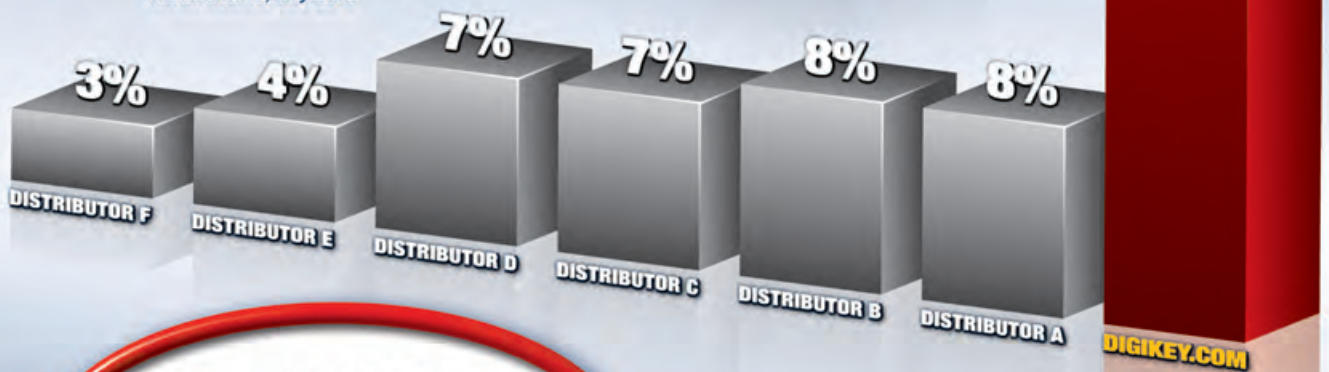
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Source: Which single distributor comes to mind as being 'best of class' for Broadest Overall Product Selection?

2012 Design Engineer and Supplier Interface Study,
Hearst Business Media, Electronics Group,
North America, May 2012



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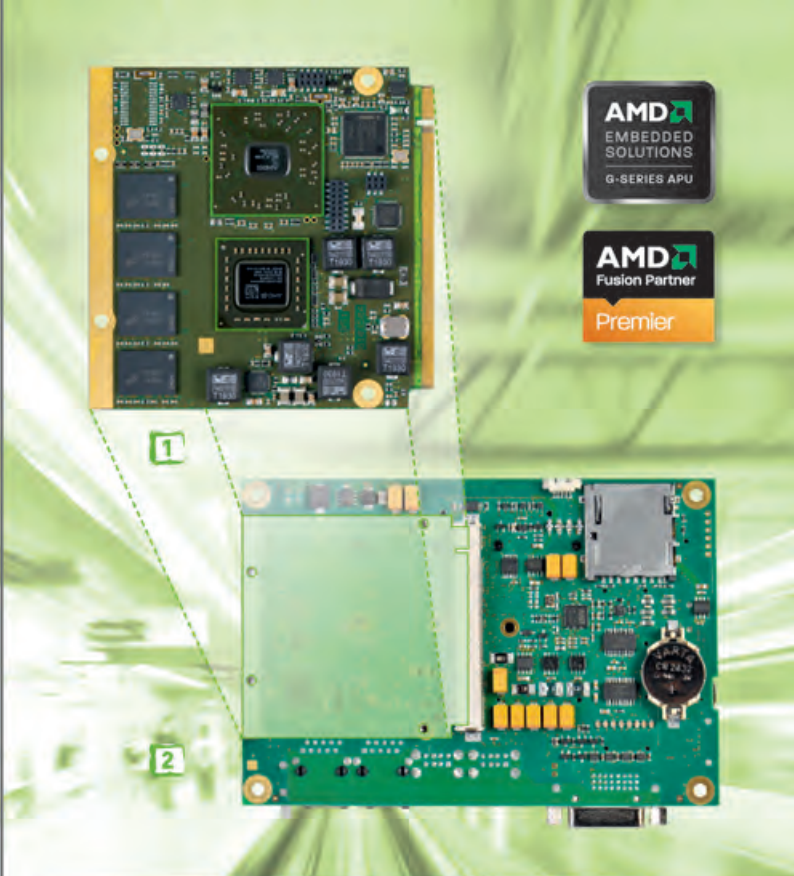
If you look into the market of small form factor boards there are so many so called standards that I believe you could think about whether the expression standard really makes sense. But it seems that all of these standard find their place in the market. Our cover story starting at page 6 describes an new COM Express product range based on the latest chipsets for the 3rd generation of Intel Core processors provide maximum flexibility to conga-tec COM Express module families. conga-BS77 series support "classic" Type 2 pinout and conga-TS77 Type 6 pinout featuring High-End external graphics, multiple Display- Ports and USB3.0. Processor support ranges from the latest Intel Core i7 quad core processors of the 3rd generation ("Ivy Bridge") to low cost single core Intel Celeron 827E.

One of the few downturns Moore's Law with processor structures getting smaller and smaller is the fact that even with decreasing total TDP (Thermal Design Power) the heat density on the die increases.. So - simply spoken - the heat has to be transferred faster and more efficiently away from the processor package. With the significantly smaller geometries of the Intel 3rd Generation Core processors generation this can be a serious issue. Special algorithms protect these processors by slowing down their clock frequency at higher temperatures. On the other side a similar mechanism allows for an aggressive over-clocking of up to 50% using the Intel Turbo-Boost 2 technology as long as the die temperature is uncritical. So for best performance and highest reliability a smart cooling technology is required to ensure that the turbo boost feature is not lost through local overheating.

An improved cooling system which is based on cooling pipes and integrated to the standardized heat spreader of the COM Express specification allows for an ultra fast transportation of the heat away from the CPU and enables top performance. Benefits are lower processing temperatures which are essential for a more frequent activation of the Turbo Boost 2 technology ensuring maximum COM performance and less thermal stress for the entire system. As a result, the processor can operate above the specified maximum permissible TDP. This proves once again, that the electronics industry always find solutions to keep Moore's law going.

Yours sincerely

Wolfgang Patelay
Editor



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High-end Graphics on economic, compact Module

1 MSC Q7-A50M NEW

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2 MSC Q7-MB-EP4 NEW

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Cover Story:

Fly First Class – pay economy PAGE 6



congatec is providing a full line of products and dedicated accessories for Intel's 3rd generation of Core processors. Wide scalability on base of just three compact basic COM express boards enables the development of economy rate systems based on Celeron technology without compatibility problems.

Next-generation commercial aviation data bus interfaces PAGE 14



Commercial aircraft generally have multiple interfaces onboard such as ARINC-429, MIL-STD-1553, synchro/resolvers, discrete signals, AFDX, and other data busses, yet ARINC-429 often serves as

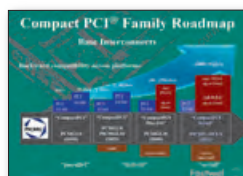
the main command and control bus. This article reviews these various standards and their use in combination, including the sharing of data from one bus over to another.

High speed and signal integrity: the relevance of the backplane PAGE 22



With current and future data rates, a backplane can be either an integrated central hub, or a bottleneck for high-speed signals in a system. It depends on the solution partner and their know-how and implementation resources.

CompactPCI Serial specification for modular embedded computer systems PAGE 25



This article reviews the new basic specification of CompactPCI Serial, and explains why it was necessary to develop this specification when two basic specifications already existed in the PICMG consortium (ATCA and MicroTCA) and one in the VITA consortium (VPX/OpenVPX). It highlights the advantages of the different system architectures for specific tasks.

Box PC using USB as extension bus for I/O boards PAGE 32

For its intelligent communication and alarm server, Comron relies on modular Box PCs from the system integrator Aaronn. To achieve a cost-effective application design Aaronn uses Kontron's Pico-ITX motherboard enhanced with I/O boards connected via USB.



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Full COM Express product range based on the Mobile Intel® QM77 Express Chipset

congatec is providing a full line of products and dedicated accessories for Intel's 3rd generation of Core processors. Wide scalability on base of just three compact basic COM express boards enables the development of economy rate systems based on Celeron technology without compatibility problems.



■ New chipsets for the 3rd generation of Intel® Core™ processors provide maximum flexibility to congatec's new COM Express module families. conga-BS77 series support "classic" Type 2 pinout and conga-TS77 Type 6 pinout featuring High-End external graphics, multiple DisplayPorts and USB3.0. Processor support ranges from the latest Intel® Core™ i7 quad core processors of the 3rd generation ("Ivy Bridge") to low cost single core Intel® Celeron™ 827E.

The 3rd generation ("Ivy Bridge") of Intel® Core™ processors sets the standards for today's premium class of embedded processors. Shrinking the manufacturing process from 32nm to 22nm and introducing a new technology with 3D tri-gate transistors results in smaller die sizes reducing the cost of manufacturing and increasing power efficiency as much as 25%. The new integrated Intel® HD4000 graphics features now 16 instead of 12 parallel processing cores boosting inbuilt graphics power about 40% supporting up to three independent high-definition displays. To ensure maximum compatibility with existing projects and to support future trends and progress congatec provides Type 2 and Type 6 pinout variants of their latest COM Express modules.

With its flagship quad-core model Intel® Core™ i7-3615QE, featuring a clock rate of 2.3 GHz in normal and up to 3.3 GHz in turbo mode with the same 45 W TDP as previous 2nd generation models, Intel demonstrates the ultimate in performance capable in today's embedded processors. The Intel® Core™ i7-3612QE processor is a milestone for embedded applications offering top performance in quad-

core processor with an impressive clock rate of 2.1 GHz in normal operation and up to 3.1 GHz in turbo mode with a TDP as low as 35W.

And this is exactly the maximum TDP today's passive cooling thermal interfaces can handle with reasonable cost and effort. This opens doors to many applications in medical, commercial and military technology, where fanless operation is a must to meet enhanced reliability, safety or shock resistance requirements. Many of these applications can make use of quad-core processors for the first time now. Another improvement over previous models is the much larger turbo boost span, which now allows clock speed increases of up to 50%. Many applications which do not require the highest performance at all times can now use processors with lower basic clock rates and lower power consumption. Where turbo boost and graphics performance are not an issue and two independent displays with standard Intel® HD Graphics are sufficient the Intel® Celeron® 847E (2x 1.1 GHz, 2 MB Intel® Smart Cache, 17 W) and 827E (1.4 GHz, 1.5 MB Intel® Smart Cache, 17 W) are the perfect economy solution. The conga-TS77 even offers USB 3.0 support with these Intel® Celeron® processors.

The COM Express module can as well be equipped with a various Core i3, i5 and i7 dual-core processors and up to 16GByte of fast dual-channel DDR3 memory (1600 MHz). Four SATA ports with up to 6 Gb/s enable the use of fast mass storage devices. Fan control, LPC bus for easy integration of legacy I/O interfaces and the Intel® High Definition audio

interface complete the feature set. With the Mobile Intel® QM77 Express Chipset supporting processors from Intel Celeron 800 to Core i7 users of congatec's conga-TS77 and conga-BS77 COMs can enjoy the luxury of a most wide range of scalable performance without rerunning tedious verification and requalification processes.

With regards to power consumption and computing power, the 3rd generation Intel Core processors provide even broader scalability than its predecessors. For the first time, quad-core processors are now a viable solution for fanless operation.

The conga-BS77 (Type 2) and the conga-TS77 (Type 6) modules support 4 serial ATA interfaces with RAID support, 8 USB 2.0 EHCI, LPC and fast mode multi-master I²C bus interfaces, ACPI3.0 power management with battery support, GB Ethernet with AMT 8.0 and up to 16 GB DDR3 SO-DIMM 1600 MHz DRAM on 2 sockets. Both models utilize the internal Intel® HD4000 graphics engine (Celeron®: Intel HD graphics with DirectX10.1 only). It supports DirectX 11, OpenGL 3.1, OpenCL 1.1, as well as high performance MPEG-2 hardware decoding in order to decode multiple high-resolution full HD videos in parallel.

COM Express Type 6 Module - As defined for Type 6 modules the conga-TS77 uses dedicated pins to provide three independent Digital Display Interfaces (DDI), which can be used as DisplayPort or TDMS (for DVI or HDMI). With the PEG Port no longer being multiplexed with the graphics output signals external graph-

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Image scale 1:1



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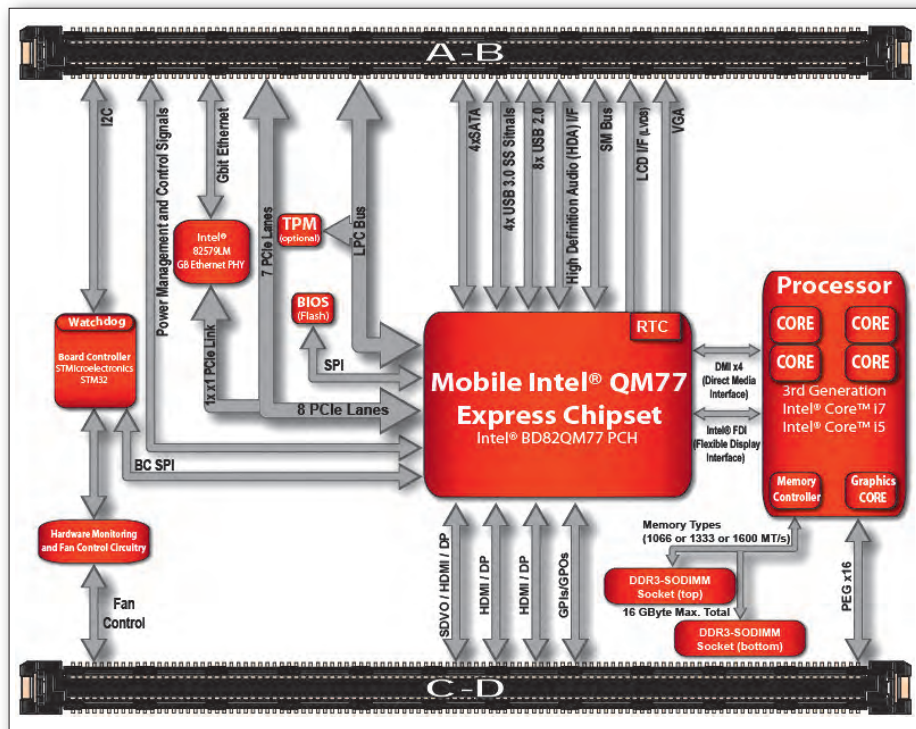


Figure 2. Block diagram of conga-TS77, Type 6 module

ic cards or chips can be addressed with an increased bandwidth of 8 GT/s as scheduled for PEG 3.0. The conga-TS77 supports eight USB 2.0 ports, four of them capable of USB 3.0 SuperSpeed with a bandwidth of up to 5 GBit/s while sending and receiving simultaneously. The PCI Bus and the IDE interface have been discontinued with Type 6 modules and the conga-TS77 provides seven PCI Express lanes for customized interfaces to be placed to the carrier board.

COM Express Type 2 Modules - The Type 2 modules conga-BS77 and conga-BP77 are providing six PCI Express Lanes and eight USB

2.0 ports, but no USB 3.0. conga-BP77 is focused to support external graphics via PCI Express Graphic (PEG) for extreme graphics performance on Type 2 implementations. The PEG connection or graphics chip is implemented via a customized carrier board. The freely available schematic for the evaluation carrier board provides a perfect template to develop custom high-end solutions. The PEG bifurcation for the PEG port allows splitting the 16 lanes to multiple x8 or x4 lanes in order to support non-graphical devices utilizing the extreme high data bandwidth. This is frequently used for data transmission of audio and video streams interfacing high resolution cameras.

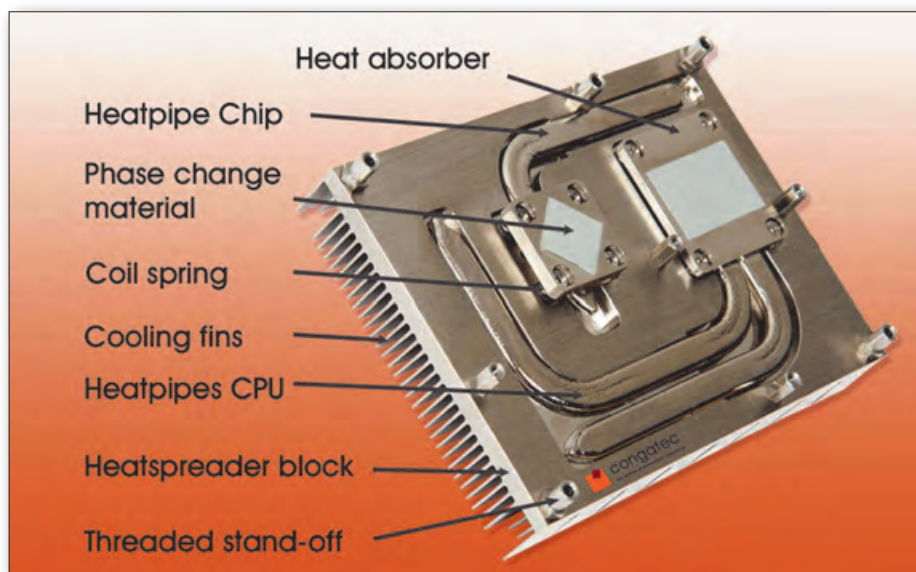


Figure 3. The individual components of congatec's cooling pipe solution

High Performance Cooling enables quad processor usage

One of the few downturns Moore’s Law with processor structures getting smaller and smaller is the fact that even with decreasing total TDP (Thermal Design Power) the heat density on the die increases. So - simply spoken - the heat has to be transferred faster and more efficiently away from the processor package. With the significantly smaller geometries of the Intel 3rd Generation Core processors generation this can be a serious issue.

Special algorithms protect the processor by slowing down its clock frequency at higher temperatures. On the other side a similar mechanism allows for an aggressive overclocking of up to 50% using the Intel Turbo-Boost 2 technology as long as the die temperature is uncritical. So for best performance and highest reliability a smart cooling technology is required to ensure that the turbo boost feature is not lost through local overheating.

An improved cooling system which is based on cooling pipes and integrated to the standardized heat spreader of the COM Express specification allows for an ultra fast transportation of the heat away from the CPU and enables top performance. Benefits are lower processing temperatures which are essential for a more frequent activation of the Turbo Boost 2 technology ensuring maximum COM performance and less thermal stress for the entire system.

As a result, the processor can operate above the specified maximum permissible TDP. For the cooling of less power-hungry and low-end applications, the congatec modules offer a TDP management solution which can limit the power consumption in line with the existing cooling and power supply facilities.

The advantages at a glance:

- ✓ Fast hot spot cooling for full performance
- ✓ Elimination of gap filler layer
- ✓ Elimination of mechanical stress leading to better quality
- ✓ Improved cooling extends module life span
- ✓ Heat pipe principle enables innovative customer-specific cooling solutions

The revolutionary new heat pipe cooling design is available in several variants: active and passive cooling solution, heat spreader and customer-specific solution creating space for innovative ideas. As an option the heat pipe can be custom designed in such a way that it can be connected to a customer-specific heat sink or housing to enable or enhance fanless designs. So designs can be optimized for the specific application.

Benchmarked against the previous “pipe less” cooling solution results showed an in average 14°C lower CPU temperature for the heat pipe version. With this, the modules have a higher thermal reserve, which increases their life span and reliability. Average temperature reductions of only 5 Kelvin can double the statistical life span – a convincing argument when considering the total cost over the lifetime of a system.

Summary

congatec is providing a full line of first class products and dedicated accessories for Intels 3rd generation of Core processors. The widest scalability in the market on base of just three compact basic COM express boards (Type 2 with SDVO, Type 2 with PEG port, Type 6) enables the development of economy rate systems based on Celeron technology without compatibility problems. ■

New COM Express Connector Pinout Type 6

The newly defined Type 6 builds on the same success factors as Type 2 but also takes into consideration future interfaces. The A-B connector has almost the same pinout as Type 2 Rev. 2.0. Only some reserved pins are used for UART, FAN (PWM), Lid and Sleep signals. The UART pins (2x SER_Tx/Rx) were added for debugging purposes (e.g. console redirection) due to their simplicity. One of those can optionally be used as CAN interface. Additionally, a new pin has been defined to indicate physical presence to an optional TPM chip located on the module. The fact that these pins are used on Rev. 1.0 systems for supplying the module with power requires that module and carrier board designers spend some additional time to ensure that these interfaces can withstand a connection to a 12 V rail. This provides the ability to connect a Rev. 1.0 module to a Rev. 2.0 carrier board, or vice versa.

COM Express Type 2		COM Express Type 6	
AB	CD	AB	CD
Ethernet	IDE	Ethernet	USB 3.0 0-3
LPC		LPC	
SATA 0-3	PCI 32 Bit	SATA 0-3	PCIe 6-7
I2C		I2C	
HDA		HDA	
USB 0-7		USB 0-7	DDI 0-2
ExpressCard		ExpressCard	
PCIe 0-5	PEG/SDVO	PCIe 0-5	PEG
GPIO		GPIO/SDIO	
LVDS		LVDS/eDP	
KBD		SER 0-1 / CAN	
SPI		SPI	
Power	Power	Power	Power

COM Express feature comparison for type 2 and type 6

In contrast to the previously mentioned small signal changes on the A-B connector, the C-D connector covers most of the Type 6 features. It gets rid of parallel legacy interfaces such as PCI and IDE and provides support for current and future interfaces.

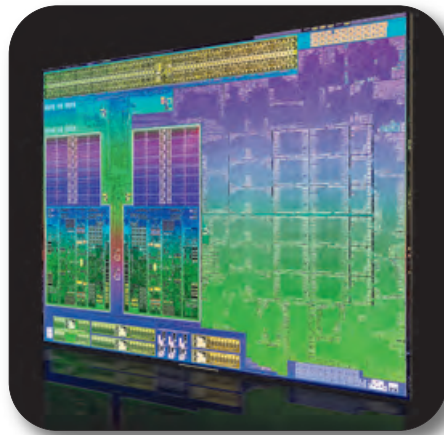
These changes can be summarized with 3 main categories:

- Up to four USB 3.0 Interfaces
- Up to three Digital Display Interfaces
- Up to 2 additional PCIe lanes

APUs enable high performance and low power on small form factors

By **Cameron Swen**, AMD Embedded Solutions Division

The onward march of embedded applications design requires ever-increasing performance for new and emerging graphics intensive and visually immersive applications. At the same time, innovative SFF and low power designs are required to put these applications into small and highly mobile systems. Accelerated processor units can fill the gap between these conflicting demands.



■ With the ever-increasing transistor budgets, architects of traditional x86 CPUs have focused performance improvement efforts on techniques such as increasing clock rates, expanding the size and number of on-chip caches, and adding additional processor cores. Performance gains have been tremendous, however as fast as these modern x86 processors are, they alone still cannot deliver the image, video, and digital signal processing horsepower that many emerging interactive multimedia embedded applications demand, and at the low power required by small form factors.

Unlike traditional PC applications primarily built on scalar data structures and serial algorithms, emerging embedded applications, such as medical imaging and intelligent cameras, require processors that can handle vast amounts of data consisting of hundreds if not thousands of individual threads that must be manipulated and processed in parallel. As opposed to the conventional sequential-processing CPUs, modern graphics processing units (GPUs) are optimized for massive parallel computing – whether graphics or otherwise: They have evolved into powerful, programmable vector processors with hundreds of processing cores, making them highly scalable and setting the stage for GPGPU (general-purpose GPU) computations of highly parallel workloads to accelerate a wide variety of these data-intensive algorithms

and applications. Smaller die geometries and new innovations in silicon design enabled have AMD to create the first family of single-die CPU+GPU solutions. With up to hundreds of computing cores, these heterogeneous multi-core processors, or APUs, can help reduce the size and power of embedded systems dramatically while at the same time increasing performance. APU stands for accelerated processing unit, which combines both x86 processing cores and discrete-level graphics processing units on a single die. They earned the name APU by making the GPU fully programmable, offering acceleration to the processor for compute-intensive tasks. Using proven AMD x86 core technology that can efficiently cut through scalar workloads and through vector workloads using enhanced versions of its GPU technology, total system performance can now be enhanced.

The first APU, the AMD G-Series APU, was released in 2011. It contains 80 GPU cores and is capable of achieving 90 GFLOPS of single-precision performance. The AMD G-Series APU is still a suited solution for low power, small form factor and fanless embedded applications. The new AMD Embedded R-Series APU increases the number of parallel compute units to 384, resulting in up to 563 GFLOPS of single-precision performance (greater than 6x that of the AMD G-Series APU) while increasing average power consumption by only

a few watts. This makes it an excellent choice for demanding embedded applications such as casino gaming, digital signage, medical imaging as well as security and surveillance that demand high performance but still require a power-efficient solution.

The AMD integrated architecture reduces the board footprint of a traditional three-chip x86 platform to two chips: the APU and its companion controller hub. With just over 1400 mm² of combined chip real estate and under 2400 pins, the AMD Embedded R-Series platform integrates a high level of integration, reduced pin count, low power consumption, and rich I/O support, making it an ideal choice for small form factor designs that require ever-increasing levels of performance. New low-profile-expandable small form factors are here, and thanks to APUs, these form factors will deliver capabilities not previously available.

Furthermore, the smart integration of the new APU solution eliminates many external signals and busses found in traditional high-integration solutions, making it much easier to route within a small footprint or by eliminating costly board layers. The platform uses a 0.8mm ball pitch for the APU and a 1.2mm ball pitch for the controller hub, resulting in significantly more area for routing additional traces between balls and for breaking out all the signals (in-

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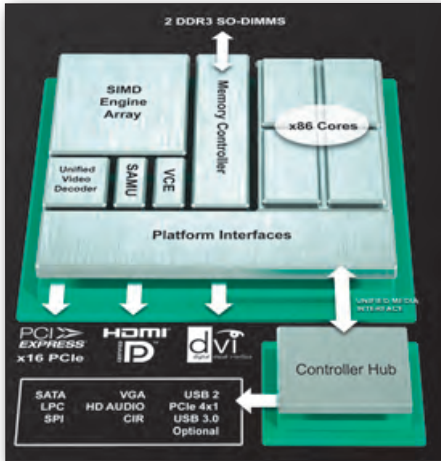


Figure 1. The architecture of the AMD Embedded R-Series platform integrates all major system elements, including x86 cores, GPU vector (SIMD) engines, and I/Os on a space-saving two-chip solution.

vice-specific tasks. For example, the top of the line AMD R-464L APU rated at 35W TDP consumes just over 13 watts while running 3DMark06, which gives the GPU, CPU cores, memory controller, and a portion of the I/O a significant workout. This represents significantly lower power consumption than what the TDP alone would indicate.

This overall low power consumption is one benefit of the heterogeneous multi-core architecture of the new APU, as the application code can be executed on the most power-efficient core in the system. Additionally, power management has been built in to every aspect of the APU and controller hub at both the system and core level. At the heart of the APU platform power management architecture is a centralized, highly programmable application power management (APM) controller. This controller essentially allows the operating system to maintain the temperature of the APU within pre-defined limits by controlling power limits of each individual compute unit including the GPU. By this the operating system and applications can ensure that the needed level of performance is achieved, while minimizing overall power consumption by ensuring that all blocks are put into low power state when idle and enabling active cores to operate at higher frequency/voltage levels when needed.

cluding power and ground) from the device to a minimum number of PCB layers. Another crucial parameter for board and system developers is the TDP (thermal design power) of the platform. While TDP is important, embedded applications are becoming more and more device-specific. For these cases, the TDP of a part may be misleading since it may not accurately represent the actual power that will be drawn during the execution of a set of de-

Product News

■ Kontron: COM Express reference carrierboard for type 6 COMs

Kontron has launched a new reference carrierboard for COM Express basic and compact Computer-and-Modules with pin-out type 6. The COM Express Reference Carrier Type 6 carries out all the interfaces that state-of-the-art COM Express Computer-on-Modules with pin-out type 6, such as the Kontron COMe-bSC6, the COMe-coH6 and the Kontron COMe-bIP# with the 3rd generation of Intel Core processors, make available.

[News ID 15743](#)

■ AAEON: fanless Pico-ITX board with Atom N2600 processor

AAEON released its latest small form factor Pico-ITX board, measuring only 100mm x 72mm, powered by the dual core 1.6GHz Intel Atom N2600 low power consumption processor and Intel NM10 express chipset. The PICO-CV01 offers high performance per watt in the compact form factor, to meet the demands of high-end industrial and various fanless embedded applications.

[News ID 16125](#)

■ MicroSys: create custom devices based on an ARM Cortex-A8 SBC

MicroSys implements customer specific control and HMI devices rapidly, for rugged and harsh environments, if needed. Certification and SW services and long term supply is provided as additional offering. As basis MicroSys relies on their wide spectrum of miriac MPX System on Modules and Single Board Computers utilizing Freescales Power Architecture/QorIQ, ARM Cortex and X86/Intel Atom CPUs.

[News ID 15769](#)

■ Rutronik becomes European-wide distribution partner for emtrion

Rutronik Elektronische Bauelemente is now able to offer the comprehensive portfolio of RISC-based CPU modules, developer kits and single-board computers from emtrion. In addition to HMI and multimedia applications, the target application is industrial data processing. This new partnership with emtrion has enabled Rutronik to expand its range of RISC-based solutions for the embedded market.

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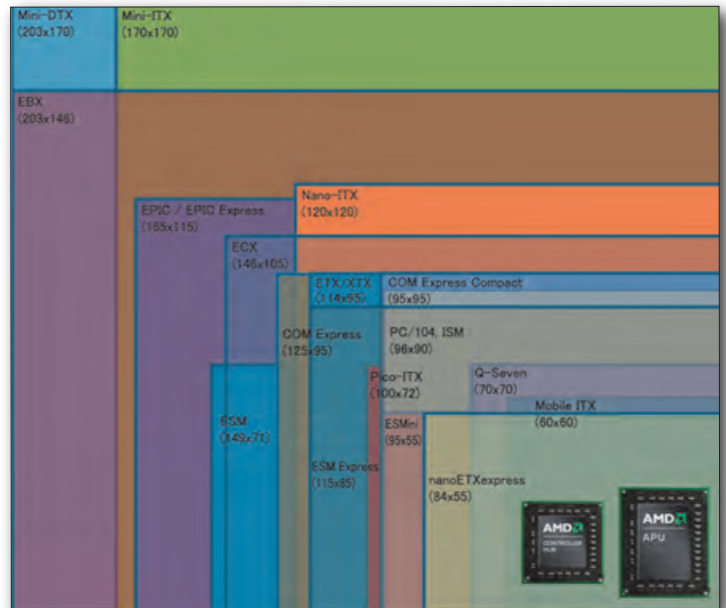


Figure 2. The new AMD Embedded R-Series is fits for nearly all popular embedded SFF standards. (Note the relative size of the AMD Embedded R-Series APU and controller hub compared to PCB size.)

So, for example, on the AMD R-464L APU for graphics or parallel processing applications, the power allocation can be shifted to the GPU for up to a 38% boost in graphics speed, while staying within the defined power limits. For CPU-intensive applications, the power allocation can be shifted to the CPU for up to a 39% boost in CPU speed. Also other parts of the platform contain innovative power-reducing techniques including power management of all major I/O interfaces, which enables it to individually power-down unused or inactive PCIe lanes. Furthermore, the width (number of lanes) of certain links can be changed dynamically to save even more power. And dynamic DRAM speed reduces power when bandwidth requirements are low.

For applications requiring high performance multi-media capabilities, the new APU also offers a variety of new power-saving features. These include the video compression engine that provides a dedicated hardware video encoder, to quickly and efficiently encode video. The secure asset management unit enables GPU-assisted encryption and decryption of content. And enhancements to the unified video decoder extend the capabilities of the platform to include dual, high-definition video decode. Each helps to minimize CPU utilization when dealing with video and reduce APU power consumption.

Another primary objective in developing the new APU platform was to bring a new level of performance and power efficiency to the broadest array of embedded small form factor standards as possible. Also, by supporting the vast majority of I/O contained within these standards with the minimal requirement for external circuitry, the platform accelerates design cycles while maximizing the number of options system designers and their customers have to choose from.

Finally, the heterogeneous APU architecture helps to accelerate software development through support for open programming standards such as OpenCL combined with support for DirectX 11 (including DirectCompute), which are helping to enable software developers to get the maximum performance out of the system. AMD also provides the AMD accelerated parallel processing (APP) software development kit (SDK), a complete development platform that helps enable fast and easy development of parallel processing applications. These tools enable developers to create standards-based applications that leverage the combined power of CPU cores and GPU cores, and that can run on a wide variety of hardware platforms. ■

Product News

■ MSC: new product catalog features COM Express and Qseven modules

MSC releases a new 56-page comprehensive product catalog. The "Embedded Computer Technology" catalog displays an extensive range of innovative board level products and includes basic technical data for all available COM Express, Qseven, ETX, EXM32 and nanoRISC modules as well as the industrial computer components marketed by MSC.

[News ID 15919](#)

■ ADLINK: COM Express modules with quad/dual core i7/ i5 processor

ADLINK presents its latest COM Express offering, the Express-HR. The Express-HR is a high performance COM.0 R2.0 Type 6 module featuring an Intel Core i7/i5 processor with and supporting the latest digital graphics interfaces for future designs. With its high-level processing and graphics performance and long product life the Express-HR is ideal for medical, gaming and military applications.

[News ID 16099](#)

■ MPL: headless industrial solution with ARM CPU

The new CEC4 expands the MPL Compact Embedded Computer product range with a headless industrial solution with ARM CPU. The system comes with Gigabit Ethernet and special designed housing, allowing operation in harsh environments without the need of fans or ventilation holes. The CEC4 comes with 3 Gigabit Ethernet interfaces. The specifically designed CEC housing allows the CEC to operate in harsh environments without the need of fans or ventilation holes, and can easily be mounted on a 35mm DIN-Rail or with a flange on a wall.

[News ID 15932](#)

■ BVM: low power fanless Mini-ITX motherboard

The new Mini-ITX LV-67I from BVM is based on the NM10 Express chipset supporting the third generation 32nm dual core Intel Atom N2800 and D2550 64-bit processors running at 1.86GHz in the FBCGA559 socket. Both are low power devices, the N2800 is rated at 6.5W and the D2550 at 10W, enabling them to be used in fanless designs in slimline and portable equipment.

[News ID 15942](#)

■ IPC2U: Computer-on-Module for data and graphics

IPC2U introduces ICES 267S High-End Computer-On-Module, which is based on the PICGM COM.0 Rev 1.0 specification. This module can be equipped with a powerful Intel Core i7/i5/i3 Quad-Core CPU. Combined with the QM67 PCH chipset, the Intel HD graphic

card with the DirectX 11 interface as well as with up to 8GB DDR3 RAM, the module develops remarkable performance particularly in graphic applications. ICES 267S shows considerable power, which can be successfully used in automation, medical area, advertising, surveillance, retail, military or governance.

[News ID 15890](#)

■ congatec: COM Express module supports new Intel Core processor variants

congatec releases the conga-TS77 which supports

the latest 3rd generation Intel Core processor variants and the new Mobile Intel QM77 chipset. The Type 6 COM Express module offers more performance, improved energy efficiency, greater security thanks to Intel VT and optional Intel AMT 8.0 support. The conga-TS77 is immediately available with support for the Intel Core i7-3555LE (2.50 GHz, 4 MB Intel Smart Cache, 25W), Intel Core i7-3517UE (1.7 GHz, 4 MB Intel Smart Cache, 17 W) and Intel Core i5-3610ME (2.7 GHz, 3 MB Intel Smart Cache, 35W) processors.

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ECRIN Systems core business is the integration of COTS building blocks based on VPX, Compact PCI, COM Express, PICMG 1.3, Industrial Mother Board, xTCA standard form factors, to achieve best semi-custom system performance at reduced cost, SWaP-C conditions and shortest time to market with low NRE. ECRIN take care of environmental qualifications for your embedded computers.

Added to Computer-on-Demand solutions, ECRIN offers sub-contractor and engineering services: consulting for system architecture, studies and specifications, thermal management, semi and full-custom designs, assigned project managers, software engineering, qualification, ruggedization, supply-chain, long life management, on-site integration support, maintenance, technical support...

As an example, see on figure 1 an Industrial Computer developed specifically by ECRIN Systems, for the French Navy and used now as a standard product on different sea programs, respecting STANAG qualifications, with FRU rackable connector for quick MTTR in case of trouble (no PC harnessing cables to the cabinet).

(Figure 1):
O.D.M. for Navy Apps

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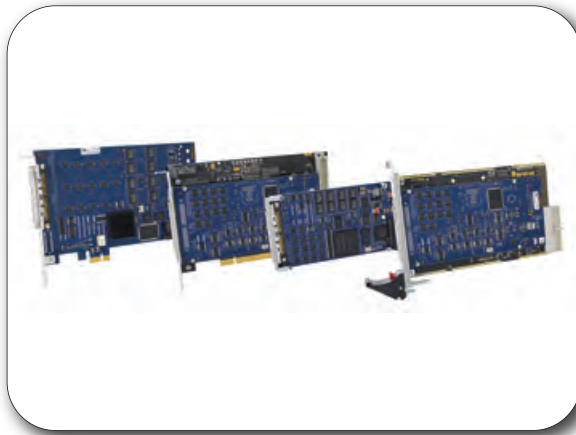
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Next-generation commercial aviation data bus interfaces

By **George Los**, Data Device Corporation

Commercial aircraft generally have multiple interfaces onboard such as ARINC-429, MIL-STD-1553, synchro/resolvers, discrete signals, AFDX, and other data busses, yet ARINC-429 often serves as the main command and control bus. This article reviews these various standards and their use in combination, including the sharing of data from one bus over to another.



■ ARINC-429 is a data bus that has separate transmit and receive ports and has been widely used on many commercial aircraft since its introduction in the late 1970s. This standard defines the bus of the air transport industry for the transfer of digital data between avionics systems on commercial aircraft. The physical connection wires are twisted pairs carrying balanced differential signals. This bus architecture offers a point-to-point connection for a receiver and transmitter. The standard does allow up to 20 receivers to be hooked up to one transmitter. The transmitter identifies the equipment and message type via an 8-bit label that is part of the standard 32-bit message. ARINC-429 has been used in all commercial aircraft and has traditionally been the lower cost commercial alternative for MIL-STD-1553. There are a variety of suppliers for ARINC-429 boards and components and it is still, and will continue to be, widely used in many commercial aircraft electronic communication systems.

MIL-STD-1553 is a protocol standard that defines the electrical and functional characteristics of a serial data bus that has been mainly used in military aircraft. The bus architecture of MIL-STD-1553 allows for reduced size and weight of systems and the wiring that interconnects them, is inherently reliable, and incorporates redundancies that make it a safe data bus solution. Since 1978 it has served as the primary

command and control interconnect in military aircraft. MIL-STD-1553 has a large installed base in a wide variety of ground vehicles, ships, helicopters, fighter aircraft, missiles, satellites and more recently commercial aircraft. The performance, reliability, and safety that made MIL-STD-1553 the standard for military aircraft for more than 3 decades is now being designed in as the standard for next generation commercial aircraft. The inherent reliability, robustness, maturity, and superior EMI performance of MIL-STD-1553, combined with recent competitive price reductions, has allowed it to be used on commercial aircraft. As an example, recently Airbus selected Data Device Corporation MIL-STD-1553 components for use in critical primary flight control systems on the A350 XWB commercial aircraft. Data Device Corporation (DDC), designs and manufactures a wide range of MIL-STD-1553 and ARINC-429 components, test boards, rugged embedded boards, rugged small form factor boards, and software.

ARINC-717 is another bus standard and it is used for all commercial aircraft and helicopter flight data recorders, quick access recorders, and black boxes. Commercial aircraft generally utilize multiple interfaces, such as synchro/resolvers, discrete signals, ARINC-429, MIL-STD-1553, AFDX, and other data busses. A main computer, called the DFDAU (digital flight data acquisition unit), sits in the front of the

aircraft and collects all the various I/O inputs and outputs via one ARINC-717 data bus that interfaces to the back of the aircraft. This saves the weight of having to bring multiple interfaces to the recorders and also lowers the recorder size and weight. In addition, all commercial aircraft can now understand recordings acquired on other platforms. For example, Boeing aircraft can understand Airbus recordings. There are a few different types of data recorders used depending upon application and data requirements. A QAR (quick access recorder) is used by lab technicians to download flight data and simulate it in the lab, while the FDR (flight data recorder) is only accessed in catastrophic failures. There are times when flight entertainment systems need to access some data on the avionics bus, and need to either input ARINC-717, if located near the recorders, or ARINC-429, if in the front of the aircraft.

As technology progresses, the need for higher computational systems and higher speeds have become necessary for some of the critical airborne systems. Also as time goes on, new capabilities are introduced that could save time and increase efficiency onboard many aircraft if these capabilities were effectively added. Additionally, new capabilities are constantly being added to platforms with the intent of decreasing the time it takes to perform a function, or increasing functionality and capability of an aircraft

while at the same time decreasing the weight of the electronics onboard the aircraft. Yet when new systems are proposed there is always a tradeoff between the added weight of the system and a potential drop in weight-carrying capability. New flight entertainment systems are a great example of added capability onboard many commercial airliners. In many cases new busses like AFDX or Gigabit Ethernet have been added to commercial systems but ARINC-429 still is used for command and control in applications where lower bandwidth is acceptable.

As more upgrades occur the number of ARINC-429 channels may actually increase and different busses may be added to the aircraft. This creates a need for higher channel count ARINC-429 cards for use in systems integration labs and simulators. Many systems integration labs and simulation systems deal with hundreds of ARINC-429 channels at a time within a system and they also deal with many real-time challenges. Onboard the aircraft there are typically 4 or 5 receivers connected to each transmitter, so to drive communications in a simulator you need the inverse setup. DDC recently introduced a complete series of ARINC-429 cards that offer up to 36 channels of ARINC-429, 2 channels of ARINC-717, and 16 avionics level discrete I/O. Each ARINC channel can be programmed to either be a receiver or a transmitter, to offer ultimate flexibility in simulators and systems integration labs where the channel mix can vary between transmitters and receivers.

Systems integration labs also commonly add real avionics units in the loop at various points of integration and might simulate the box at other points. With the DDC card you can keep your existing cabling and change a transmitter to a receiver or vice versa when using real hardware, or simulating the hardware with the card. The boards also meet the stringent real-time demands of simulation systems by utilizing onboard hardware scheduling and a DMA offload engine to ensure real-time performance and data sample consistency. The DMA engine allows for burst data transfers between the card and the host computer to reduce processor utilization on the host computer. The series is available in PCI, cPCI/PXI, PMC, and PCIe form factors for compatibility in all types of systems. The PCIe card is an x1 lane PCIe interface such that it can plug into all PCIe slot types from x1 lane to x16 lane interfaces. The cards offer the most advanced test features with parametric test functionality/error injection, variable output voltage, and onboard voltage monitoring. Now there is no longer a need to carry a heavy oscilloscope to your lab if you are debugging an ARINC-429 bus issue. As different busses are added to airborne platforms, an increasing demand has surfaced to share data from one bus over to another bus

interface. For example, Ethernet sensors might need to share data with a mission computer that only has ARINC-429 interfaces on it. Instead of upgrading mission computers, a network bridge device can be used to port Ethernet to ARINC-429 or vice versa. DDC is presently in the process of introducing the AceXtreme bridge device (ABD) that contains 6 programmable Tx/Rx ARINC-429 Channels, 2 Gigabit Ethernet Channels, and 2 MIL-STD-1553 channels. The device can be configured to port any protocol to any other supported protocol so that the device will automatically run when powered up. This will allow platform upgrades that add new capabilities to take place while

leaving existing command and control avionics networks intact without requiring any changes. With this modular approach aircraft data can be shared with any system onboard.

While ARINC-429 remains an option as a data bus for critical applications in commercial avionics, designers can now take advantage of performance, safety advantages, and lower weight offered by supplementary data busses, such as MIL-STD-1553. Data Device Corporation remains committed to providing total support for all commercial and military data bus applications and requirements, now and in the future. ■

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Embedded video requirements drive new mezzanine card format MXC

By Craig McLaren, Wolf Industrial Systems

Sophisticated graphics have hit the embedded systems world and are increasingly demanded by military, aerospace, industrial, and medical applications. Graphics are challenging even in the desktop world, but in embedded designs they present unique issues that include very specific, non-standard functionality.



■ Take an airplane cockpit. It may need to drive three or more screens, each displaying different information deriving from, and possibly combined from, different sources. A tank may have a similar requirement, but what's displayed on the screen in the tank is likely to be different because (at the very least) the tank has to do without windows. Meanwhile, a control room might have six tiled screens on a wall that could be combined into a single large image or present up to six separate images. Applications like these may have little in common, except the use of a display. The information to be displayed may arrive through existing video streams or from elsewhere in the form of raw data. It may go out as one or more video streams, or it may be sent as raw information somewhere else to be further processed. Input and output video streams may be transported as a number of different video formats or over some other channel like USB 3.0 or Ethernet. They may need to drive monitors or analog displays, and they may need to do so over modern HDMI cables or old-fashioned RGB signals.

The actual processing may be as diverse as the possible signals. Requirements may be as straightforward as frame grabbing, AES256 encryption, or compression using a standard like H.264, or they may require a general-purpose graphics processor to implement specific

custom processing. Different systems employ these functions in custom combinations. And most of them have severe size and/or weight constraints that mandate the most compact possible implementation. These functions can be implemented on mezzanine cards affixed to a standard carrier board like Eurocard (VPX, CPCI, or VME) or COM Express baseboards. But the card must accommodate a large number of video channels (inbound and outbound) and formats, as well as the ability to exchange data quickly over a format like PCI Express (PCIe). Graphics standards like SDI can signal at speeds over 3 Gbps, and inter-card data may need to move at speeds exceeding 5 Gbps. Finally - and perhaps most critically - space is best economized if multiple modules can be placed on the carrier cards.

These parameters can be compared for the most common mezzanine boards, ranging from the aging PMC card; its updates, the XMC and the FPGA-oriented FMC cards; and the MXM 3.0 format (specifically geared towards video in laptops). A quick inventory of these formats, shown in black in table 1, readily shows that high-end graphics and video processing exceed their capabilities, and that an alternative is needed. The MXC form factor from Wolf Industrial Systems, shown in table 1, specifically targets the high-end video requirements of analog, digital, and broadcast

SMPTE inputs and outputs, video mixing and overlay, H.264 compression, and AES256 encryption. The most fundamental MXC characteristic is its size: it's small enough to fit two modules on a 3U-sized card and four can fit on a 6U card. This isn't simply a matter of outer dimensions, since at 82x70mm for a Type A card, it would appear to be the same size as a Type A MXM 3.0 card. The difference is the connector arrangement: the few extra millimetres required by the MXM card edge connector makes it impossible to fit two on a 3U card (or four on a 6U card). The next obvious characteristic of the MXC form factor is the sheer number of pins - 500. The pin arrangement is shown in figure 1, and it is specifically geared for graphics and video applications. Banks of signals are available for analog or digital video in and out channels and can be configured for RS170, RGB, DP, DVI, TMDS, LVDS and SMPTE (SD-SDI to 3G-SDI) video formats. Together, as many as four different video input signals can be mixed and overlaid on up to eight different video outputs.

Video output data can be simultaneously compressed, encrypted and delivered through USB 3.0, PCIe or Ethernet 10/100/1G/10G connections. VPX carriers or baseboard-level systems using multiple MXC modules can communicate using 16 lanes of switched PCIe 2.1 or sep-



Figure 1. The MXC pinout is specifically geared towards a wide variety of video input and output formats, with 16 lanes of PCIe to support data communication.

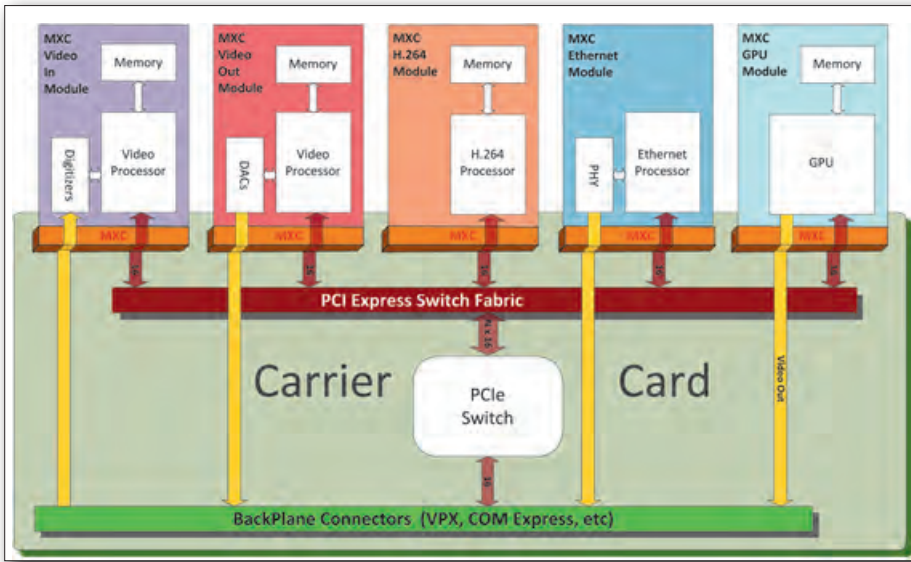


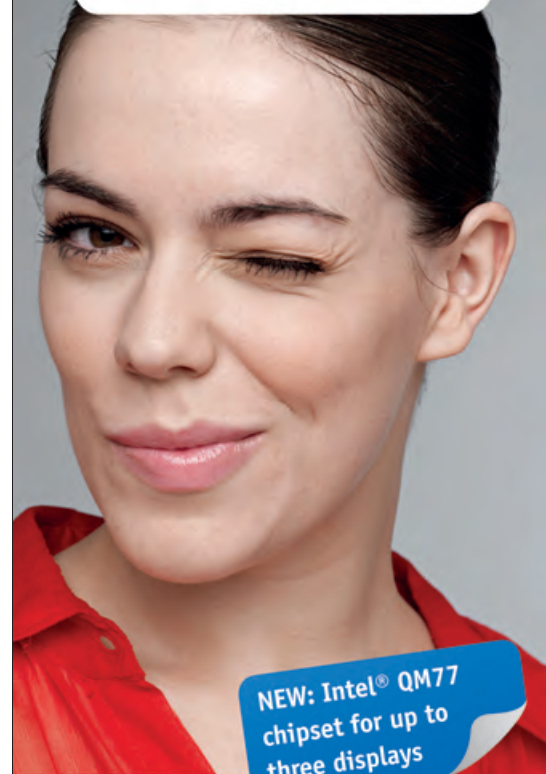
Figure 2. Multiple MXC cards can intercommunicate over PCI Express, enabling sophisticated multi-module processing.

arate video interconnect busses, drastically reducing the effort required to interface video data sources that weren't necessarily designed to talk to each other. On 3U VPX/MXC carrier boards, 32 PCIe lanes switch between the two MXC modules, enabling them to DMA each other or to communicate to the backplane. This makes it possible to create high-performance multi-board system solutions (figure 2). Four modules on a 6U card can work together on a sophisticated display algorithm using the bandwidth of 96 switched PCIe lanes. This PCIe interconnect provides a high-speed, efficient, standard way of moving data at 80 Gbps for 3U VPX/MXC carriers and 160 Gbps for 6U VPX/MXC carriers.

The achievable signalling speeds are drastically affected by the quality of the connector, visible in figure 3. Video signals may need to travel at over 3 Gbps; the so-named generation 2 PCIe revision has doubled the original PCIe rate to 5 GT/s (Giga-transfers/second, equating to 5 Gbps for a single lane), and it is anticipated that this speed will increase with future generations of PCIe. Because the MXC card uses a Samtec Searay connector, it can handle up to 10-Gbps signalling, providing headroom for today's speeds and extending the useful lifetime of the card as signalling speeds increase in the future.

Such high-speed signals require careful grounding, so each differential pair has its own ground. The power supply needs are also minimized since the MXC card requires only two power supplies (5V and 3.3V). With no components on the actual cards requiring a higher voltage, power design can be significantly simplified; power consumption is reduced as well. Finally, MXC is a rugged form factor. The Searay connector is rigid and reliable, as is the removable heat plate (shown in figure 4, which allows customers a simple interface for convection or custom conduction cooling). Both are designed to withstand severe shock, vibration, and environmental extremes. MXC board designs conform to RAIC design standards, MIL-STD-810 compliance and are designed to IPC Class 3 solderability standards, providing an overall module that will stand up to the harsh operating conditions - -40 to 85°C and high humidity - to which these systems are likely to be subjected.

Examples of modules that can be interconnected and configured in numerous ways include: a video processing card featuring an 800-MHz AMD Radeon E6760 GPU with 1 GB of 700-MHz GDDR5 memory and the ability to output six independent video outputs in combination of DisplayPort, LVDS, TMDS, HDMI 1.4a, DVI-D, or VGA; a module that



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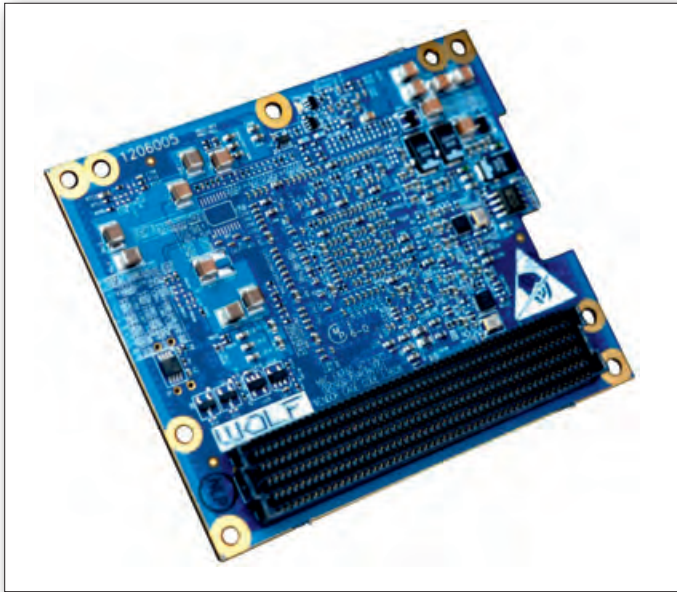


Figure 3. Viewed from the bottom, the MXC card offers a sturdy 500-pin Samtec Searay connector minimizing footprint while allowing 10-Gbps signaling.



Figure 4. The MXC module seen from above, and with the heat shield shown detached from the board it protects. The heat shield allows the use of reliable conduction-cooling techniques.

can compress, and output HD-SDI uncompressed video at 1080P60, as well as output compressed H.264 and encrypted AES256 video over PCIe, USB or Ethernet, with additional FPGA space available for customized features; a GPGPU card with an AMD Radeon E6760 parallel processor using OpenCL1.1 SDK providing 560 GigaFLOPS of processing power; a four-channel frame grabber with two NTSC/PAL/SECAM inputs and two VGA

inputs; and a video mixer with TMDS, RGB analog and two SMTPE video inputs for mixing or overlay. While a need will remain for the standard card formats in the domains where they dominate, designers are increasingly looking for alternatives like the MXC card for sophisticated high-performance applications involving the management and creation of multiple video streams. Standard COTS form factors - and in particular, COTS Open-VPX and

VPX-REDI standards with their various interconnect capabilities and system compatibilities - will always govern the military, industrial, medical and aerospace domains. The MXC form factor fully embraces the modern serial-fabric Eurocard 3U and 6U form factors with Open VPX and VPX-REDI MXC carrier boards, making it possible to create very sophisticated video graphic systems on a single VPX board. Likewise, MXC cards can provide excellent video graphics companion modules for designers building COM Express baseboards.

One of the first extreme rugged conduction-cooled computer units integrating the MXC GPGPU mezzanine for SWaP-C Mil/Aero apps, is the ONYX platform proposed by Ecrin Systems, our European partner for WOLF COTS building blocks, which combines the Core i7 second and third generation general purpose Intel multi-core processor with the 480-cores E6760 GPU from AMD offering 576 GFLOPS, with -40°C up to 70°C operating temperature range. ■

Format	Size		Video I/O	Pins	PCIe Lanes	Max Freq. (GHz)	Rugged
	Cards/3U	Cards/6U					
PMC	1	2	I/O	<<100	NA	<<1	Y
XMC	1	2	I/O	<<100	8	3.125/5	Y
FMC	1	3	I/O	160/400	5	10	N
MXM 3.0	1	2	Output only	285	16	5	N
MXC	2	4	I/O	500	16	10	Y

Table 1. The existing standard form factors cannot meet the needs of advanced graphics designs, meaning that a new form factor is needed.

Product News

■ **GE: rugged platform allows FACE developers to try COTS software**

GE Intelligent Platforms announces the FACEREF1 Software Reference Platform designed to allow organizations developing FACE-compliant applications to take advantage of a COTS that is pre-configured, pre-validated and pre-tested. It provides a platform for customers to try COTS software, develop application code, and demonstrate capabilities on a rugged platform that is capable of being deployed on real airborne platforms.

[News ID 15969](#)

■ **Curtiss-Wright: rugged video mission display delivers 1080p resolution**

Curtiss-Wright has introduced the newest member of its Skyquest family of rugged mission displays. The new Skyquest AVDU4300 17" widescreen display provides full 1080p resolution for the best high definition imagery and is designed specifically for the demands of defense and law enforcement applications.

[News ID 16100](#)

■ **BittWare: half-length Altera Stratix V PCIe board for OpenCL applications**

BittWare announces availability of their S5-PCIe-HQ, the latest addition to their S5 family of products. The S5-PCIe-HQ is a half-length PCIe Gen3 x8 card based on the high-bandwidth, power-efficient Altera Stratix V GX or GS FPGA. Altera will target the S5PH-Q as a platform for OpenCL development and demonstration.

[News ID 16098](#)

■ **Kontron: COM Express Computer-on-Modules with 3rd gen Intel Core in numerous variants**

Kontron supports the new 3rd generation Intel Core processors on 14 COM Express basic Computer-on-Module variants. The new Kontron COM Express basic COMe-bIP# modules – available in both the Type 2 and Type 6 pin-outs each with numerous different processors – offer long-term availability, an unprecedented level of graphics and processing performance, support of three independent displays, USB 3.0 and fast PCI-Express Gen 3.0.

[News ID 15715](#)

■ **AdaCore: SmartSide adopts Ada and GNAT Pro for smart devices platform**

AdaCore announced that SmartSide has adopted the Ada programming language and AdaCore's GNAT Pro development environment for the implementation of their Smart Devices platform. SmartSide offers multi-energy meter data management systems. Distribution Network Operators use SmartSide technology to optimise their Smart Grid networks through the secure, reliable, highly-interoperable and business-oriented Smart Energy Core platform.

[News ID 15784](#)

■ **congatec: COM Express Type 2 module supports high-performance external graphics**

congatec adds the conga-BP77 to its portfolio of 3rd generation Intel Core modules. This version is based on the COM Express Type 2 connector pin-out and supports the PCI Express graphics port for high-performance external graphics. The conga-BP77 module version is therefore well suited to medical, gaming and multimedia applications needing high end graphics performance, for which the internal graphics support from the chip set no longer suffices. The PEG connection is implemented via a customized carrier board. The freely available schematics for the evaluation carrier board conga-CEVAL provide the perfect baseline for developing proprietary solutions.

[News ID 15950](#)

■ **IEI: SBC and CPU module with 3rd gen Intel Core processors and QM77 Express chipset**

IEI has launched the KINO-QM770, a Mini-ITX SBC, the NANO-QM770, an EPIC SBC, and the ICE-QM770, a COM Express Basic Type 6 module. The KINO-QM770 is a Mini-ITX SBC with Socket G2 for the 3rd generation Intel Core processor family.

[News ID 15899](#)

■ **Curtiss-Wright: rugged multi-platform mission computer system targets avionics and avionics**

Curtiss-Wright has introduced the newest member of its family of fully integrated Multi-Platform Mission Computer subsystems. The new MPMC-9105 VMC is an ultra compact, volume optimized system designed for space, weight and power-constrained avionics and avionics applications. This COTS subsystem features a compact and lightweight small form factor ideal for use on platforms such as UAVs, helicopters and ground vehicles. This highly rugged subsystem is especially well suited for platforms requiring general processing with deep and diverse IO requirements including video.

[News ID 16010](#)

■ **Concurrent: 6U CompactPCI SBC supports dual- and quad-core 3rd gen Intel Core processors**

Concurrent Technologies introduces their latest 6U CompactPCI processor board utilizing 3rd generation Intel Core processors. The PP 91x/x1x is a single slot air-cooled SBC allowing customers to easily migrate to the latest generation of Intel Core processors while reaping the benefits of significantly improved performance per Watt and extending

the lifecycle of already deployed solutions. The 3rd generation Intel Core processors, based on 22nm process technology, provide increased performance for an equivalent power budget when compared to the 2nd generation Intel Core processors.

[News ID 15709](#)

■ **AMP: PCI104 HD capable video encoding card**

Combining two of the most sought after features – HD quality video and ultra-low latency - the HD2000 Video Encoding card from Advanced Micro Peripherals is ideal for environments where high quality image capture is essential while its low latency (under 40ms) offers the real time visual feedback required by remote control applications. The HD2000 is particularly suited to all types of surveillance environments, particularly those where image clarity is crucial and is perfect for providing information regarding situational awareness, for example, monitoring assets, border or perimeter monitoring.

[News ID 15756](#)

■ **ADLINK: ETX-CV COM opens seamless upgrade path and prolongs lifetime of ETX based systems**

ADLINK announces the ETX-CV, the newest member of its Computer on Module family. Based on the latest dual-core 32nm process Intel Atom Processor and NM10 Express Chipset, the ETX-CV represents ADLINK's commitment to serve its ETX customer base with continuing product development. The ETX-CV is targeted at replacing current entry level and older high performance ETX modules (up to Intel Core Duo Processor L2400). Power consumption ranges between 6 and 12 watts and is much lower than that of previous generation products.

[News ID 16101](#)



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Satellite provider fixes business-critical error in orbiting satellite

By Peter Kleiner, Wind River

A small satellite provider recently developed a satellite including an integrated system with hardware and software. To meet customer requirements, and protect the provider from a \$10 million liability, the integrated system had to be fail-proof in orbit. Wind River VxWorks was chosen for the operating system, and Wind River Test Management for environmental testing that couldn't be achieved with any other solution.



■ The company is a small, 40-employee company that develops custom satellites for defense agencies and civilian enterprises. Founded 10 years ago, it is one of a handful of private companies that stepped up to fill a void created by reductions in NASA budget and operations. It develops satellites using commercial off-the-shelf (COTS) hardware and software as well as custom integration software. It integrates customer payloads using standard serial I/O interfaces.

Central to the satellite provider's business strategy is taking full responsibility for the "payload container" part of the system - guaranteeing to the end customer that the integrated system, comprising hardware and software, will work correctly in orbit, and accepting the cost of fixing any defects. The company typically works on spacecraft valued at approximately \$100 million, of which the integrated-system portion represents 10%; so it is potentially liable for \$10 million in case of a catastrophic software failure that renders the entire system inoperable. This makes testing absolutely critical, because a failure of this magnitude could conceivably put the company out of business.

The aerospace industry is wary of unproven technologies. So when it came to selecting an operating system for a recent satellite project, the natural choice was Wind River VxWorks -

a proven real-time operating system (RTOS) that has already been successfully used in more than two dozen spacecraft, including the Mars rover. The underlying COTS hardware was BAE Systems Electronic Solution RAD750, a radiation-hardened single-board computer based on PowerPC 750.

The software team is made up of seven people primarily responsible for the application software layer, written in MATLA B. This lean team is responsible for coding and testing at the OS level, including VxWorks and drivers. A significant portion of testing is done using MATLA B to drive a software simulation of the testing environment. But once the software is moved to the environmental testing phase - which involves real hardware and real software running in a limited access vacuum chamber - the company relies on Wind River Test Management. This meets customer requirements for testing production binaries on real hardware - or test code as it will fly.

There are many challenges to overcome when testing a satellite. Due to limited on-board memory and storage space, the software runs a stripped-down version of the operating system, without a full IP stack for connectivity. This greatly limits the ability to diagnose problems. There's a radio link for command and file transfer, but no Ethernet port. Another

challenge is the need to simulate the Earth-orbit environment. In low Earth orbit, the satellite travels at 7km/second and needs to acquire GPS information from its antennae as it is traveling. It must deal with rapidly changing magnetic fields to ensure it always has the proper orientation. It must also deal with the radiation-intensive environment of space, which may cause memory errors due to bit-flipping. All these conditions - both the extreme conditions of normal operations (speed, temperature, etc) as well as anomalous conditions that may cause faults - must be simulated for proper testing. If not, they could lead to very costly defects.

The sensorpoint technology in Wind River Test Management allows to set the environment by simulating GPS information, satellite orientation, and other data streams that the software processes as it would in-flight. The company uses sensorpoints for fault simulation, feeding erroneous data sets to trigger high temperature errors and other failures during testing. It also uses sensorpoints to monitor conditions within the satellite during testing and faults to verify test success. Therefore more than 50 sensorpoints were developed, ranging from simple one-liners that collect diagnostic information by printing out values of sensors, to complex 75-line C programs that enable retrying buffer reads as a

workaround for certain error conditions. Because Wind River Test Management streamlines the process for testing and simulating faults using sensorpoints, the senior flight development engineer was able to complete the work of three people during this two-year phase of the project. This alone translates into a labor cost savings of \$.5 million.

Even with thorough testing performed on the ground, a flawless product cannot be guaranteed, and unexpected problems sometimes arise. Soon after launch, the satellite reverted into a near-complete failure mode. It could communicate with the ground station but it couldn't perform its required functionality of reporting conditions to the ground team. It was theorized that a spurious interrupt caused this erroneous state. Using Wind River Test Management, the company was able to first replicate the problem on the ground and confirm that a spurious interrupt had caused it. Then a fix and tested patch was devised in the lab to verify that it would fix the problem - which it did. The next challenge was how to get the fix into the orbiting satellite.

Traditionally, deploying this type of patch on an orbiting satellite would require revalidation of all software followed by a lengthy upload process done in multiple parts because the communication window with the satellite is only 10 to 20 minutes long. Following the upload, it would normally be necessary to reboot the satellite - a potential one-shot fix that could render the device unusable if it failed. The company avoided all of these costly procedures and pitfalls using Wind River Test Management. The fix was implemented using

a sensorpoint, and the only software modified on the satellite was the Test Management patch. This patch was less than 4% the size of a traditional upload and was done in seconds instead of using the entire communication window. Utilizing the dynamic code instrumentation capabilities of sensorpoints, the patch was installed and enabled on the live running software without requiring a reboot and without the risks associated with such a shutdown and power-up sequence. This left enough time to test the patch during the communication window, and possibly disable it in the event that it failed to fix the problem. It also left the satellite in a usable state so that if the first fix failed, the company could easily try another.

Luckily, none of these backup plans were needed because the fix worked correctly. Therefore considerable time was saved, including the potential for weeks of engineering effort to resolve the spurious interrupt problem. Using a traditional method, it may have taken a team of six people at least a month to resolve the issue.

Wind River Test Management, with its sensorpoint technology, helped to perform essential environmental and in-orbit testing and fixes that wouldn't have been possible using any other solution. It did all this while introducing significant savings in labor and development costs and averting costly testing procedures and pitfalls. In the future, it is planned to use Wind River Test Management on all projects, extending its use to include code coverage. The company is also evaluating Wind River Simics as a solution to begin software development and testing much earlier in the cycle, independent of platform availability. ■

Product News

■ Portwell : COM Express Compact module for medical and defence

Portwell releases the PCOM-B219VG, a Type 6 COM Express Compact module based on the 3rd generation Intel Core processor and Mobile Intel QM77 Express chipset (4.1W). The Com Express module includes Intel Turbo Boost Technology for faster processing, Intel vPro Technology for superior remote capabilities and Intel Hyper-threading for multithreaded processing.

[News ID 16056](#)

■ Curtiss-Wright debuts RACE++ support on CHAMP-AV5 VME DSP engine

Curtiss-Wright Controls Defense Solutions announces that its dual Intel Core i7-based CHAMP-AV5 DSP VME engine now supports RACE++ fabric communications with

Eclipse's MEM1600 RACE++ XMC mezzanine modules. With support for RACE++, the CHAMP-AV5 can now be used to upgrade legacy systems designed with older processor technology without requiring replacement of existing backplanes and enclosures.

[News ID 15837](#)

■ Schroff: compact VPX system and suitable backplanes

The VPX specification enables many different software protocols and above all fast serial data transfer. This includes PCI Express, RapidIO and Ethernet. For laboratory use, for testing individual PCBs or complete applications under the VPX specification, Schroff now presents a compact VPX desktop system.

[News ID 15804](#)



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High speed and signal integrity: the relevance of the backplane

By **Andrei Birlan and Frank Weiser**, Elma

With current and future data rates, a backplane can be either an integrated central hub, or a bottleneck for high-speed signals in a system. It depends on the solution partner and their know-how and implementation resources.

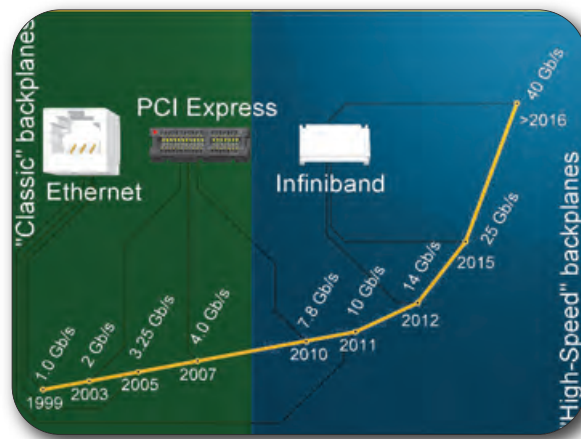


Figure 1. Exponential growth of data rates

■ Data rates are evolving exponentially. A decade ago “high-speed” denoted data rates beyond the 528Mb/s of CompactPCI, nowadays we are facing 10 to 14 Gb/s data rates. Backplanes which used to be off-the-shelf-commodities are today mission-critical shares of high-speed transmission between the components of modular rack-based systems. While traditional parallel bus systems could be easily implemented with conventional technology, current serial busses with their data rates up to 14 Gbps need a different approach for a successful implementation. At these data rates it is vital to consider the entire signal path between driver and receiver (card-connector-backplane-connector-card) as one entity to preserve good signal integrity within its required range for proper operation. As an example, figure 2 shows a channel compliance scheme for OpenVPX as proposed by VITA.

Signal integrity is a complex subject. It is affected by many different factors which influence each other. The challenge is to find a compromise which provides a safe solution at best cost, by optimizing parameters which correlate non-intuitively with each other. As in any chain, the weakest link defines the quality and reliability of the entire chain, here the signal path from driver to receiver. As most of the topics are purely physical this is relevant for all kinds of high speed serial transmissions,

no matter what the standard/technology (e.g. ATCA, MicroTCA, OpenVPX, CompactPCI Serial) or the relevant protocol is (e.g. PCI Express, Serial RapidIO, Ethernet, Infiniband, etc). At the end it’s all about data rates and physics, with the connector pair and the transmission path being the relevant components. Another goal for a good backplane is to be hardware-agnostic, which means that it has to work with all sorts of combinations of compatible hardware, no matter what kinds of components and drivers are actually used.

The question for the designer of embedded systems is: what are the key factors? Signal speed is the main factor and can be derived from the required data rate per channel. Crosstalk and dielectric losses increase proportionally to the frequency; skin effect increases with the square root of the frequency, and via stubs affect the signal quality in a non-linear dependency once a certain frequency is exceeded.

Trace width is quite important as it directly affects skin effect losses and signal attenuation. However wider traces require larger layer spacing to maintain the same impedance value which increases possible via stub lengths. Also the higher floor space demand can result in a need for additional layers, and with this additional vias, decreasing signal quality and in-

creasing cost. Trace length directly affects losses due to skin effect and dielectric material losses. The latter effect can be compensated by special low-loss material at the penalty of higher cost and longer lead times.

Via stub effect used to be the most critical factor. It is caused by resonance effects of “unused” parts of plated-through vias. With PCB technology further developing, these negative effects can now be widely avoided by back-drilling, i.e. mechanical removal of the stub, or at least big parts of it, by drilling out the non-active parts of the via plating at relatively moderate cost.

Crosstalk sensitivity also increases with higher frequencies. It can be minimized by decreasing layer spacing to reduce the signal-ground distance. However this has negative effects, through the then-necessary reduction of the trace widths to maintain constant impedance, which increases skin effect losses. Another option is increasing separation between differential pairs, which could mean additional layers and a resulting cost increase because of higher floor space demand.

The connector type and version has significant impact on crosstalk, too. This is due to two reasons. Firstly it arises within the connector itself with its given geometry and spacings,

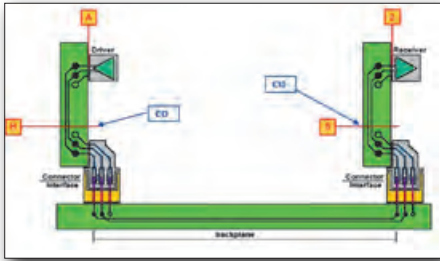


Figure 2. Signal flow reference (Source: VITA)

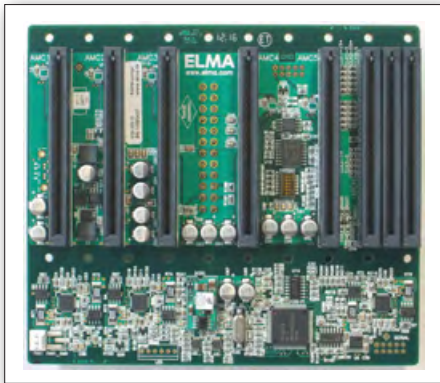


Figure 3. Elma bluleco backplane

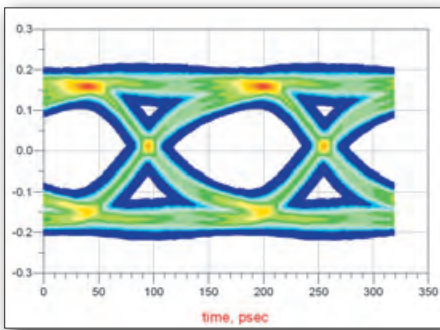


Figure 4. Eye diagram without crosstalk

and secondly because in many cases the spacing between differential pairs is imposed by the distances between the connector pins.

Drivers and chipsets to transmit and receive data can influence signal quality a lot. Ideally backplanes should be driver-agnostic, practically they are adaptable within a certain range. Designers can select some driver parameters (e.g. pre-emphasis levels), or make a choice of different coupling options to adapt and fine-tune specific configurations of components from different vendors, which might be otherwise limited in their compatibility.

Layout peculiarities can result in unexpected resonances corrupting signal integrity. In particular antipads can influence signal quality drastically. There are some thumb rules for recommended isolations depending on signal rates, however an exact qualification asks for simulation. Also GND references and shielding of signals, as well as the proximity of GND

vias when changing layers with differential pairs, have significant effects on the signal quality, and have to be well respected in a proper layout.

Due to the complexity and non-intuitiveness of the parameters involved, it is quite difficult to create new solutions from scratch. Being the central hub of the system a proper working backplane (i.e. proper signal routing between the components of the system) is vital for mission success. So buy or make is no serious choice in most of the cases. The remaining challenge is to get the different components from different vendors working together properly, which is challenge enough. A proven concept from an experienced backplane specialist is a good base in any case to get a new product to the market in time.

Previewing operation and detecting possible challenges in an early project stage is a good idea and can be done using simulation. The results of the simulation, however, can only be as good as the quality of the simulation models and the simulator used. Also it needs some experience in how to use the simulation tool and how to link the various simulation models together. Outsourcing this to an experienced partner typically saves lots of time and costly resources. With successful and reliable simulation results, the time-to-market of the overall solution can be shortened, failure risks can be minimized and costly redesigns can be avoided.

Elma uses the Agilent ADS system for functional and 2-D simulation based on IBIS, IBIS-AMI or Spice models provided by the driver vendors. On-demand backplane entities can also be simulated with a 3D-field solver simulator, to generate appropriate S-parameter values for backplane parts of the signal path.

A typical example for a modern high-speed serial backplane is the Elma bluleco MTCA backplane using MTCA/SRIO Level II technology. It has been developed and optimized for highest speeds and signal integrity, using simulation of many combinations of existing drivers and layout geometries (for trace, shielding, antipad, etc). It was verified in a physical test setup by an independent laboratory at 6.25 Gbps using an Agilent E8363B network analyzer and two different test cards. Examples of the excellent results are the eye diagrams shown in figure 4 (without crosstalk) and figure 5 (including crosstalk). There is almost no difference in the eye contour of both diagrams. This proves that there is no significant crosstalk between the signals, and confirms the high quality of the backplane design and the connector set being used. Due to the low losses and small discontinuities here, there is no equalization needed - neither at the trans-



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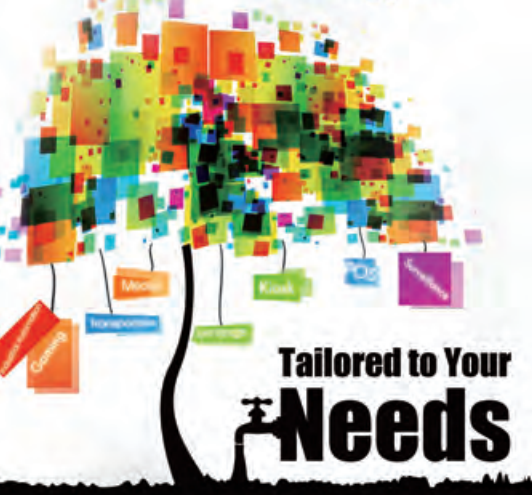


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■ **BACKPLANES**

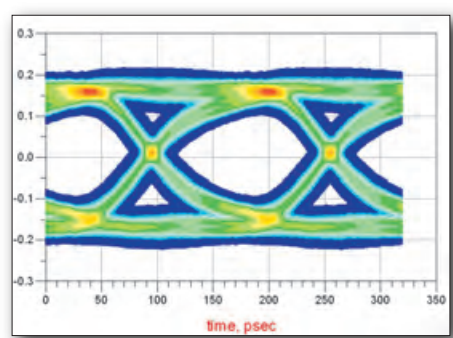


Figure 5. Eye diagram with crosstalk

mitter nor at the receiver. The result: the MTCA backplane is expected to work even at 10 Gbps. Backplane design for high speed with data rates beyond 5 Gb/s is not a com-

modity. Using simulation tools, and performing driver-to-receiver overall simulation, can accelerate the development process and development times significantly. With the large variety of design parameters and possible driver combinations, long-term experience and good simulation support are a definite "must have" to ensure high overall signal integrity, and "right-by-the-first-time", to avoid costly re-designs. A good basic design for high speed with enough reserves can be easily cost-optimized for customers demanding lower bandwidths/data rates for their applications when simulation is available for verification. As an example there could be variants of the same backplane, with no or simplified backdrilling, or based on different base materials, or using connector alternatives. ■

Product News

■ **NORCO: motherboard powers intelligent terminal network shopping platform**

NORCO has partnered with Intel to offer a board solution that can power the intelligent Network Shopping Terminal Platform. This board comes with Intel latest 3rd generation Core Processor Family, powered by Intel 2nd and 3rd GEN Socket G2 Sandy Bridge/Ivy Bridge i7/i5/i3 CPU and Intel QM67/QM77 based. Features with Intel Turbo Boost Technology and Intel Rapid Storage Technology, board with the new Core platforms brings up to 15% improvement in performance while offering new levels of protection for data sensitive applications.

[News ID 16079](#)

■ **Bicker: tested „power+board“ solutions for industry and medical technology**

With its new „Power+Board“ bundles, Bicker Elektronik offers a sophisticated solution for the development of IPC and embedded systems. These tested combinations of industry power supplies from Bicker Elektronik and industry mainboards from Kontron and Fujitsu already sparked great interest with the professional visitors of this year's embedded world exhibition. Detailed test results help system developers in finding a suitable and above all reliable „Power+Board“ solution for their specific applications.

[News ID 16076](#)

■ **Axiomtek: AMD G-series based low-power COM Express Type 2 module**

Axiomtek released CEM100, a new low-power COM Express Type 2 module powered by either a single core AMD G-Series APU T40R at 1.0GHz or the dual core T56N at 1.65 GHz paired with the A55E FCH chipset. The platform comes with two DDR3 1066 MHz SO-DIMM slots for up to 8 GB of system memory

and four SATA ports with RAID 0, 1, 10, 5. Integrated with Radeon HD 6250/6320 graphics controller with support for DirectX 11 and OpenGL 4.0, the CEM100 provides outstanding visual experience and features two DDI, 18/24-bit single/dual channel LVDS and VGA display interfaces. Moreover, this small form factor

[News ID 16119](#)

■ **DFI: microATX Embedded boards with 3rd gen Intel Core technology**

DFI announces 2 new embedded boards in its product line based on the new Intel Q77 Express chipset supporting the premium performance quad-core Intel Core i7-3770 and Intel Core i5-3550S processors. The Intel HD Graphics 4000/2500 engine integrated into the processors delivers up to 50% 3D graphics performance improvement. MB330-CRM supports 3 independent displays (2 DVI and 1 HDMI) while MB331-DR supports dual independent display (1 DVI and 1 VGA), with up to 1.8x HD to HD transcode performance increase.

[News ID 15731](#)

■ **MEN: PCIe mini cards add SIM power to CompactPCI**

The new F223 CompactPCI carrier board for PCI Express Mini Card fulfills almost any possible wish regarding wireless data transfer. In addition, the board can be expanded using a plug-on adapter module with up to 16 SIM card slots. Be it GPS, WLAN, UMTS, GSM, or HSDPA – the F223 robust PCIe Mini Card carrier board is the solution for all wireless applications in the 3U CompactPCI format. In the standard version it is equipped with two PCIe Mini Card slots as well as two SIM card slots.

[News ID 15987](#)

CompactPCI Serial specification for modular embedded computer systems

By Alexander Buravlev, Fastwel

This article reviews the new basic specification of CompactPCI Serial, and explains why it was necessary to develop this specification when two basic specifications already existed in the PICMG consortium (ATCA and MicroTCA) and one in the VITA consortium (VPX/OpenVPX). It highlights the advantages of the different system architectures for specific tasks.

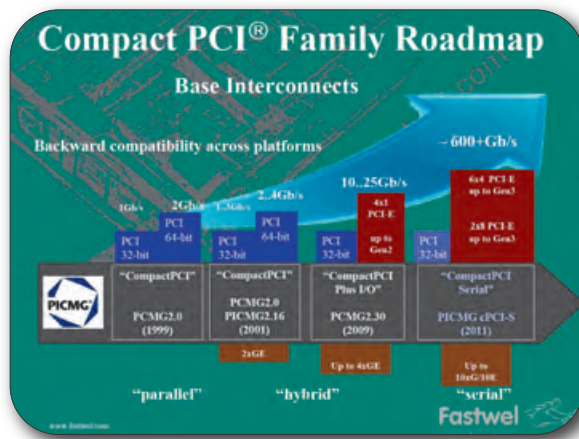


Figure 1. Development of interconnects of intermodular data exchange of the PICMG CompactPCI standards family

■ Embedded computer systems fall into two classes according to their internal architecture: monolithic (for example, the automobile computer or the electronics modules of printers or scanners), and modular, consisting of different units or boards (for example, radar data processing). The first class are generally made by big companies in millions of copies, allowing to allocate huge engineering resources for their development, and quickly recovering the development cost. With the second class of systems it is far more complicated, since volumes range from a few units to a maximum of some thousands, and the intended tasks are often impossible for just one controller or processor, while the consolidated resources consume tens, if not hundreds of watts. For combining electronic modules, it is necessary to use the one or the other technology.

Most of the world's modular embedded computer systems are developed on the basis of open standards, describing mechanical construction, heat sink, electrical connections and very often even logical protocols of communication between the system modules. Such standards simplify the development of industrial electronics products, using modules from different vendors without losing the novelty and maintainability of the solution itself. The technology of standards lies in ensuring compatibility of modules from different vendors for

creation of integral systems. The question of the right selection of standards is difficult for systems developers mainly due to two reasons. The first is that the standards themselves evolve over time in the technical aspect. This can be rather difficult to follow: changes must be monitored and upgraded versions acquired. The second reason is that the standard itself can be very interesting from the technical point of view but not popular in the market. Thus, it will be difficult to find the necessary modules both at the system development stage and, what is worse, at the mass production stage.

The CompactPCI specifications were supplemented in 2011 by the CompactPCI Serial specification. It was developed to renew the data exchange interconnects between modules in CompactPCI systems, and thereby to ensure the solution of the task of creating modular systems over the next 15 to 20 years.

The CompactPCI history began in 1999 (figure 1) when the first basic specification was published, combining the Euromechanics standard (IEC 60297) with the PCI bus. At that time the data exchange between modules was provided by the 32-bit PCI bus with throughput capac-

ity about 1 Gbit/s. This bus fulfilled the function of universal interconnect, providing both data exchange for collaborative computing and data exchange with peripheral and storage modules. In the following 10 years two specifications were issued, each of which added serial interconnects to the parallel PCI bus: 2 Ethernet channels were added in PICMG 2.16 and 4x1 PCI-E channels and 2 more Ethernet channels were added in PICMG 2.30. And at last, in 2011 the CompactPCI Serial specification was adopted, substantially increasing throughput capacities in all types of interconnects: for data exchange - PCI-E and Ethernet; for storage systems - SAS/SATA; and for input/output systems for general profile peripherals - USB 2.0/3.0.

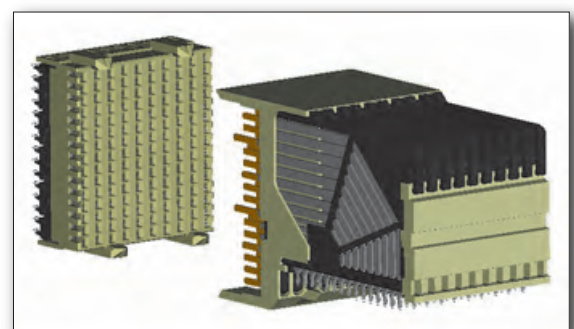


Figure 2. External view of the FCI CompactPCI Serial AirMax VS connectors installed on motherboards (on the left) and blade modules (on the right)

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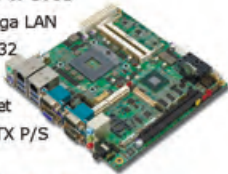


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COMPACTPCI

CompactPCI Serial at first looks to be a logical continuation of the tendency of step-by-step transition from parallel buses to serial interconnects of point-to-point type, but if you look at it more deeply and familiarize yourself with details, you will see that the CompactPCI Serial specification represents the new basic specification of the standard family, and this is very important for the industry and developers of embedded systems.

CompactPCI Serial has five key innovations: new connectors, high speed interconnects, new layout of connectors on 6U boards, a new power supply scheme and conductive cooling technology. Connectors: CompactPCI Serial uses new high-density connectors for data transfer both on the side of blade modules and on the side of motherboards (figure 2). Testing of connectors, for example, FCI AirMax connectors, showed high quality of signals transmission up to 12.5 GHz.

Connectors structure allows installation from different sides of the board, allowing thereby to apply the mezzanine concept of blade modules creation with connection of mezzanines directly to motherboards. Interconnects: CompactPCI Serial outlines expressly the four types of interconnects pins (pinout) designation and one I2C check bus on the system controllers and peripheral connectors: 8 PCI-E channels, two of which are 8 and the remaining six are 4; eight Ethernet Base-T channels; eight SAS/SATA channels; eight USB 2.0 or USB 3.0 channels; I2C bus for control and monitoring of system service parameters. At the physical level each channel consists of two differential pairs, providing data transfer from source to receiver and reverse. As all CompactPCI Serial interconnects are serial, the specification describes their topology, namely: PCI-E, SATA and USB have star topology with the

system controller (Syst) as a host, while Ethernet has a full mesh topology or, in other words, "each-to-each" topology (figure 3). It is important to note that the CompactPCI Serial standard does not impose restrictions on the configuration of motherboards, leaving this decision up to the customer and motherboard manufacturer. Respectively, some systems can be designed for connection of only one application or peripheral (Per.) module, the others - for connection of up to 24 application modules. CompactPCI Serial for 6U modules describes an additional connector on the system controller module, providing two additional Ethernet channels which can be used for ensuring compatibility with PICMG 2.16, and an additional power supply.

The mechanical structure underwent few changes but resulted in significant consequences for the 6U systems. Thus, all connectors for connection to the motherboard are now located in the upper half of the 6U plate, while the lower half remains free and can be used for installation of connectors according to customer specifications and/or for direct connection to a rear I/O module (figure 4). If the organization of the 6U system does not require support of PICMG 2.16 and additional power supply, 3U motherboards can be used in such systems.

Figure 5 illustrates different options for the implementation of CompactPCI Serial systems (a, b, c) and hybrid systems (d) with monolithic (a, c) and composite (b, d) motherboards. Advantages consist in the reduction of prices for motherboards - they now became smaller and simpler to manufacture, as well as the possibility of supporting inherited (i.e. inherited from previous specifications) interconnects (Ethernet and PCI), and the creation of hybrid systems. In addition to the improvements already mentioned, there is one special mechanical element

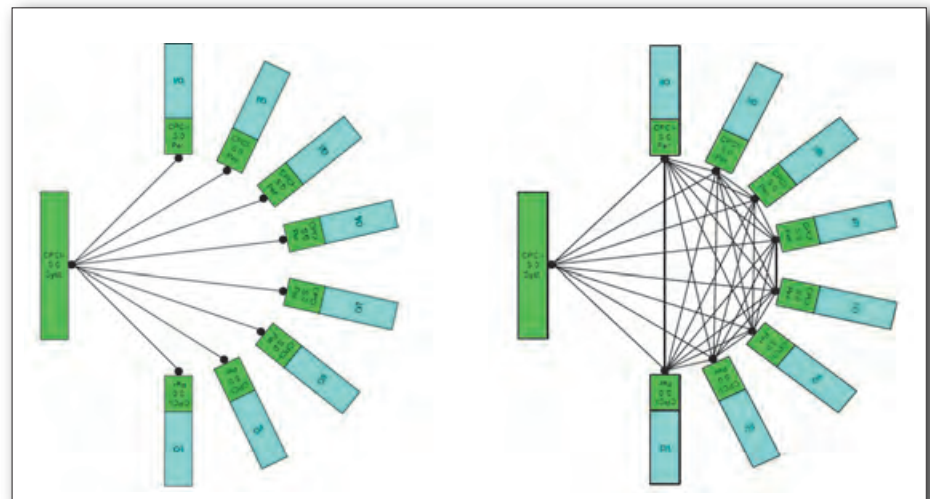


Figure 3. Intermodular interconnects topologies in the CompactPCI Serial specification: a) PCI-E, SATA and USB; b) Ethernet

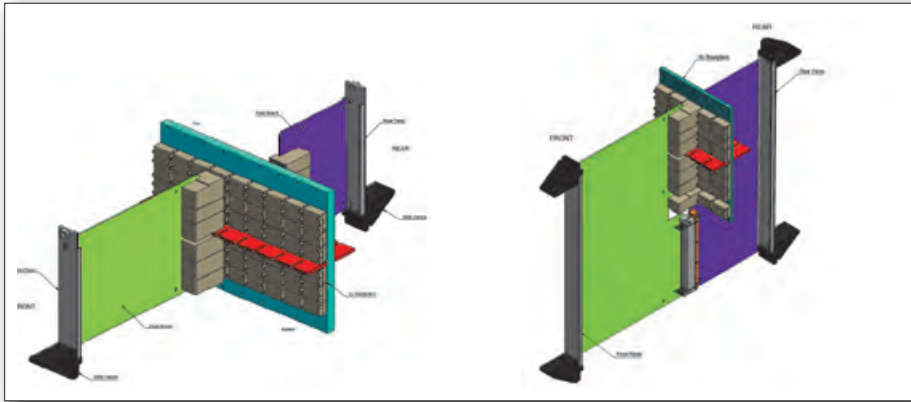


Figure 4. Examples of connection of front and rear I/O cards to CompactPCI Serial motherboards for the 6U (a) and 3U (b) systems

in 3U modules and two mechanical elements in 6U modules, directing and centering the boards when connecting to the motherboard to simplify the processes of systems assembling and modules replacement for repair.

New connectors also allowed improving the power supply system. Specifically, CompactPCI Serial requires only one supply voltage (+12V) with maximum input power of 79.8W for each 3U module and 171W for each 6U module, needed for provision of power supply to 8HP or 12HP high-productive modules, or for pro-

vision of power supply to modules with conductive or liquid cooling. CompactPCI Serial provides the system controller with the possibility to control the power supply, for example, upon occurrence of events (wake on LAN or wake on modem). Therefore, the functions implemented in all modern processors and chipsets can be used for creating an embedded system. The CompactPCI Serial specification offers developers a simple option for implementation of systems with conductive cooling. This option assumes packing of the standard board in a metal holder which is inserted into the system with the 5HP step between modules. Very often the success of new technical solutions is based on the support of legacy technologies. A good example is the success of the x86 processor architecture, supporting operation of the previously written program code. In the family of CompactPCI specifications, the new CompactPCI Serial specification provides systems developers with very wide possibilities of integration of inherited PICMG 2.0, 2.30 and 2.16 modules within one system. The CompactPCI 2.30 (PICMG 2.30) peripheral and application modules use identical connectors and are completely compatible to CompactPCI Serial.

The system controllers and peripheral 3U modules can be used in 6U systems. More Information on the compatibility of standard modules of the CompactPCI specifications family is provided in table 1. The CompactPCI Serial specification allows to implement hybrid systems in which the peripherals are based both on serial interconnects and on the inherited 32 or 64-bit PCI buses. In the 3U format the hybrid system can be implemented, for example, by means of the PCI-E/PCI bridge module connected by a cable to the system controller, and two motherboards, locating, for example, the PCI segment on the left, and the CompactPCI Serial segment on the right. Such an option is implemented by the MEN company. In the option offered by Fastwel, the bridge is implemented on the mezzanine on the left for

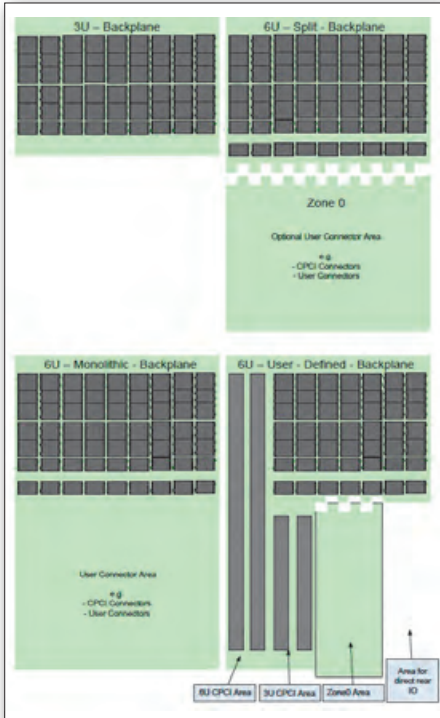


Figure 5. Options of possible motherboard creation: a) 3U CompactPCI Serial, 8 peripheral slots; b) 6U CompactPCI Serial, 8 peripheral slots, composite motherboard; c) 6U CompactPCI Serial, 8 peripheral slots, monolithic motherboard; d) 6U hybrid composite motherboard with support of 2 CompactPCI 2.0 peripheral blade modules and 6 CompactPCI Serial peripheral slots.

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the CPC510 system controller, which allows installing it in the PICMG 2.30 system controller slot and supporting both of the CompactPCI and PICMG 2.30 peripherals. The implementation of compatibility with inherited modules on the basis of PCI bus in the 6U format is already described. Compatibility with PICMG 2.16 is supported in the 6U format by an additional connector with two Ethernet channels.

The increase in input power up to 79.8 W (for 3U) and 171 W (for 6U) for the CompactPCI Serial system controllers allows installing practically any processors of PowerPC or x86 architecture. This way, using the advantages of mechanical structure, on the double width modules one can install not only soldered processors from the CPU suppliers mobile segment, but also server socket processors and vertically installed DIMM or SO-DIMM. We recall that the CompactPCI specification defined a power input of only 50W for both 3U and 6U modules, requiring application of proprietary methods for installation of server processors. The informed reader may ask why it was necessary to develop a new specification based on serial interconnects, if two basic specifications have already existed in the PICMG

consortium (ATCA and MicroTCA) and one in the VITA consortium (VPX/OpenVPX). This is a good question, and the answer is very important from the point of view of understanding the advantages of the different system architectures for specific tasks. Let's look at this in more detail.

First of all, let's compare such basic parameters as board areas, the possibilities of routing various interfaces for data input-output, and installing different components on board, as well as heat budgets. The overall dimensions and heat budgets of CompactPCI (CPCI) and VME modules are identical, therefore they can be reviewed jointly. The AMC blade modules used in the MicroTCA standard may have 3HP, 4HP or 6HP width and two board sizes – single or double. If we compare the areas of the CPCI/VME boards with the size of the AMC and ATCA boards, we arrive at two obvious conclusions as regards locating electronic components, radiators and air heat sinks. 1) The ATCA modules are non-comparable and therefore do not compete in any way with CPCI/VME and MicroTCA (figure 6a). 2) The CPCI/VME modules in 3U format have comparable characteristics with the single-size AMC blade modules for the MicroTCA systems,

while the CPCI/VME modules in 6U format show substantial advantages (plus 60 %) over MicroTCA.

It is necessary to note that the CPCI/VME manufacturers widely use the possibility of increasing the board width up to 8HP, and even up to 12HP, by installing additional boards and locating the functions required thereon, while the AMC functional modules manufacturers cannot go over the maximum size of 6HP, as this size is defined by the restriction on mezzanine thickness in (AMC is a mezzanine for ATCA). The conclusion is thus: the CPCI/VME specifications allow installing a bigger number of components, and components of a bigger size, on the blade modules, as well as tolerating heavier heat loads with air cooling, than the AMC modules in the MicroTCA systems. If we look at the areas of the front panels which determine the possibilities for installing connectors and the input/output possibilities for the different interfaces, the advantage of the CPCI/VME modules becomes obvious (figure 6b).

To be fair, it is necessary to note that the new MicroTCA.4 standard adopted in 2011 supports the possibility of directly connecting

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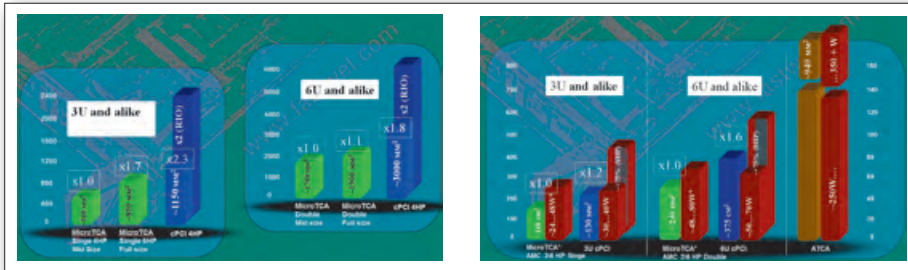


Figure 6. Comparison of CPCI/VME, MicroTCA and ATCA technologies: a) according to useful areas on boards for location of electronic components and heat sink and air cooling capabilities; b) according to useful areas of panels for location of I/O connectors.

front modules to rear modules of the same size, thereby doubling the area for components installation, and increasing the output capacity by roughly 50%. Thus, in regard to board area extension and components installation thereon, it can be said that the CompactPCI and VME specifications benefit compared with MicroTCA, while in regard to the input-output capabilities, they have substantial advantage over MicroTCA.

The VPX/OpenVPX family standards were developed by a group of contracting companies for the United States Department of Defense, with the target task of updating the VME specification and inventing a new technology for creating modular embedded systems for their customer. Originally the VPX standard (ANSI/VITA 46.0-2007 VPX: Base specification) was based on the use of new plated MultiGig RT2 connectors from Tyco Electronics with throughput capacity of 6.25 GHz; this allowed using 64 differential pairs for ensuring intermodule communication in the system on the basis of 3U boards and 192 pairs for 6U. Recently, a new connector with a throughput capacity of 10 GHz comparable to CompactPCI Serial has been standardized for the VPX/OpenVPX systems (ANSI/VITA 60.0-2012 VPX: Alternative connector for VPX). Accordingly, the VPX modules and systems manufacturers have no barrier to increasing the speed; only the timely and organized migration to use the new connector is required as the VITA 46 modules and motherboards are incompatible with VITA 60.

The next and, probably, the most important difference is the approach to description of pinouts in the CompactPCI Serial and VPX/OpenVPX standards. Namely, the CompactPCI Serial standard expressly defines at which connector pin the signal should be present. The OpenVPX standard gives this determination to the so-named profiles (pins designation and interconnection topology). These are subdivided into the modules, slots and motherboard profiles, with the number of profiles of each type described in the OpenVPX specification for 3U and 6U modules designated in tens and sometimes in hundreds

(table 2). Besides, the list of standardized interconnects is wider than in CompactPCI Serial, and the topologies of their connections include a double star, a ring, a mesh and others. In fact, OpenVPX appears as the reference manual (and the OpenVPX developers do not hide it even in the standard name: ANSI/VITA 65.0-2010 OpenVPX Architectural Framework for VPX), describing a great diversity of intermodule exchange technology implementations, while CompactPCI Serial describes specific implementations of technology. The consequences are simple and complex at the same time: intermodule compatibility is possible only within compatible profiles, which in practice means – from one manufacturer. By contrast, CompactPCI Serial allows the assembly of systems with modules produced by different companies, since the intermodule compatibility is guaranteed by the specification. And logically we see that CompactPCI Serial performs the function of facilitating creation of modular systems, so long as the modules are known to be compatible with each other.

The VPX/OpenVPX specification allows very high values of input power for the module which can be used for construction of systems with liquid cooling, as well as a bigger number of differential pairs in the 6U VPX/OpenVPX systems in comparison with CompactPCI Serial, enabling higher speeds of intermodule exchange when using a number of high-productive profiles.

With reference to modular platforms, granularity is an important parameter for developers who plan to release a line of products based on one of these technologies but with different characteristics, for example, for provision of services to a different number of subscribers or with different computational power. The granularity metrics can be different and be expressed in units of power, volume or cost, measured by a number of operations per second, etc.

Systems built on the basis of the 3U CompactPCI Serial standard have the lowest granularity, namely about 30W and \$1000, and the 6U systems – about 70W and \$3000. Such values of granularity are well-suited for creation of dif-

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PICMG 2.0 (64 bit)	Fully compatible	Fully compatible	Not applicable	Not compatible	Not compatible
PICMG 2.16	Not applicable	Not applicable	Fully compatible	Not compatible	Not compatible
PICMG 2.30	Fully compatible	Not compatible	Not applicable	Fully compatible	Limited compatibility
PICMG CompactPCI Serial	Implementation is possible	Implementation is possible	Fully compatible for 6U only	Fully compatible	Fully compatible

Table 1. Cross-compatibility of system controllers and peripherals modules for the CompactPCI range standards

	CompactPCI Serial		VPX/OpenVPX	
	3U	6U	3U	6U
Connector bandwidth	> 12.5 GHz		up to 6.25 GHz (VITA46.0) or up to 10 GHz VITA (60.0)	
Number of Differential Pairs	152	160	64	192
Connectors Pinout	Defined by cPCI-Serial Specification		Defined by Profiles for modules (VITA) Slots (26) and Crosspanels (16)	Defined by Profiles for modules (7), Slots (10) and Crosspanels (15)
Base High Speed Interconnect	PCI-E / SRIIO : 2x8 and 6x4 channels		PCI-E / SRIIO / InfiniBand / Ethernet / SATA / SAS : up to 20 x 4 depending on topology (Star, Dual Star, Extended Star, Daisy Chain, Mesh, Ring...) and Profile	
Common Interconnect	1/10 GE : 8 channels, Single Mesh		1/10 GE : 8 channels, Single Mesh and 2 to crosspanel	
Storage Interconnect	SATA/SAS : 8 каналов		SATA/SAS : 8 каналов	
General I/O Interconnect	USB 2.0/3.0 : 8 channels		none	
Switches for Serial Interconnects	Embedded Into cPCI-S System Controller (based on capability of modern CPUs platforms)		Separated VPX System module(s)/component(s)	
Power Supply	79.8 W / 12 V	171 W / 12 V and optional 91.2 W / 48 V	276 W / 3,3 and 12 V	768 W / 3,3 and 12 or 48 V
Conduction cooling	via standard module encapsulation and 5HP slot pitch		via 5HP module design for conduction cooling with reduced board space for components placement	
Compatibility of Modules	Guaranteed by cPCI-S Specification Compliance		within 11 Profiles and 21 connectors (VITA 46.0 or VITA 60.0)	within 11 Profiles, 21 Connectors (VITA 46.0 or VITA 60.0) and 33 Input Power subme

Table 2. Comparison of the CompactPCI Serial and VPX/OpenVPX technologies

ferent control and supervisory complexes, and measuring equipment. And if the 3U systems are more suitable due to their capacity for execution of customer tasks, the 6U systems have, mainly, server functionality and designation. The VPX systems given the same size and computing parameters show at least twice the cost. Accordingly, their granularity in relation to cost is higher, which may lead in some cases to going over the limits of the permissible budget when creating a line of products.

The ATCA standard-based systems have the biggest granularity – about 300W and the cost of modules about \$50 to \$8000. Thus it makes sense to use these systems for tasks with heavy loads on the switching or computing subsystems, measured in teraflops and tens of Gbit/s.

The CompactPCI Serial standard supports different back-up and hot-swap technologies. The systems developers have all possibilities open for back-up implementation. For example, peripheral modules can be duplicated or triplicated, and the replacement of an inoperable module is possible without switching the sys-

tem off (hot-swap). The full intrasystem duplication can be organized by synchronization of operation of two CompactPCI Serial segments through Ethernet channels (for the 3U and 6U systems), or using intrasystem switches (only for the 6U system).

It will be fair to note that complete intrasystem back-up is rarely used nowadays. More often distributed back-up is applied, allowing to increase the systems operability with power supply from different sources and use of distributed communication lines. The high level of intermodular switching and support of a large number of standard interfaces, such as Ethernet, is the key to success in creating systems with distributed back-up on the basis of the CompactPCI Serial specification.

Originally, the first CompactPCI standard was designed for use in the public telecommunication networks core. But since the end of the 1990s telecommunication networks have changed a lot, and the switching capacity provided by the CompactPCI systems (1 to 2 Gbps) became insufficient. Now their place in

the public networks core is occupied by the 10 to 40 Gbps ATCA systems and the rack-mount server-based solutions. But how about CompactPCI Serial?

With updated high values of the internal interconnects throughput capacity, the CompactPCI Serial standard can be successfully used in the IP-based systems intended for creation of network infrastructure. But new possibilities for CompactPCI Serial now more likely exist not in the cores of public telecommunication networks, but in their peripheral and boundary sections. Regardless of the customer type, whether a digital house, digital transport, digital office or subscribers, the equipment for their network access should be able to recognize different wire and wireless data transfer protocols, to aggregate and convert these flows in TCP/IP and to carry out their preprocessing. The CompactPCI Serial capacity, competitive prices and low granularity values – this is a partial list of the advantages which play a key role here.

If we have a look at a private network, for example at the process equipment control network or at the vehicle control network, the CompactPCI Serial system switching capacities allow its use for resolution of tasks in the core of such a private network. Already there are some successful applications, for example, the Wi-Fi Internet system in European trains.

The possibilities of the 6U CompactPCI Serial standard are also interesting for creating the wire network infrastructure connected with the support of technology of the customer devices power supply via the network cable (Power over Ethernet – PoE). Such devices include IP surveillance cameras, panel computers, controllers and other devices, consuming up to 40W. By means of the P0/J0 connector, the 6U CompactPCI Serial modules can be provided with an additional power supply of – 48V via the motherboard, with maximum current of 1.9A (91.2W).

The CPCI/VME standards have taken a strong position in many niche markets, such as production automation, complex process equipment and programmable-controlled machines management, control and communications on transport, defense systems and many others. The new CompactPCI Serial standard allows simplifying the system creation process. The system developer has the possibility to choose between 4 types of interconnects, allowing to reduce significantly the number of bridges for communication of peripherals with the system controller. Direct connection of SATA drives, including the use of chipset-integrated RAID, connection of USB cryptkeys or controllers with USB ports, CompactFlash, SD and mi-

croSD USB card readers – and this is a far from full list of the CompactPCI Serial capabilities whose implementation does not require bridge microchips and their drivers. The possibilities of releasing the PCI-E-based peripherals are extremely wide. Let's begin the list of examples with the simplest ones – expansion modules for wire or wireless data transfer, CAN controllers and COM ports on the basis of 1 PCI-E. Then we continue with the lower level graphic coprocessors, controllers with „copper“ or optical interfaces – Gigabit or 10Gigabit Ethernet. We close the list with graphic and network DSP or FPGA top level

coprocessors on the basis of 1 PCI-E. It is important to note that CompactPCI Serial overall dimensions allow creating these application boards in the form of monolithic boards, or in the form of carriers of MiniPCI Express, PCI-E, XMC, FMC cards and even of the PC/104 family.

The real-time system developers and the developers of the high-productive complexes intended, for example, for processing of Fourier conversions, should see the true value of CompactPCI Serial, as the specification providing the data exchange interconnect with

low latency (PCI-E is supported by the system controller, there are no additional switches with their time delays) and high speeds of the intermodular exchange, thus allowing the creation of clusters combining the resources of several modules.

For example, the Fastwel CPC510 module has the semi-transparent PCI-E bridge, allowing to insert it into the system controller slot and into the PCI-E peripherals slot, using it as the 4-core computing coprocessor where each core can execute up to 8 instructions of double accuracy with floating decimal point in one cycle. ■

Product News

■ **AAEON: industrial motherboard supports up to ten USB ports**

AAEON announces its newest industrial motherboard encompassing a 3rd generation Intel Core processor and Intel B75 Express chipset. The IMBM-B75A is a Micro-ATX form factor with an Intel Core i7-3770 or i5-3550S LGA 1155 processor and up to 32GB of DDR3 1066/1333/1600 (1600 for 3rd generation processor) memory is feasible with four DIMMs. Its five SATA connectors allow storage requirements to be met with ease

[News ID 15882](#)

■ **Amplicon: industrial grade routers with 500Mbps throughput**

Amplicon has released a new industrial grade router, the EDR-G902. This router is designed to establish a secure high-speed connection to remote systems with enhanced security functions, an easy configuration interface, with a rugged design. The EDR-G902 can function as a LAN-to-LAN router/firewall, a LAN-to-LAN bridge firewall and a LAN-to-WAN router/fire-

wall with NAT and VPN functionality. This flexibility means that the EDR-G902 can fortify specific areas of your automation network, such as WAN security to protect your network from external attacks, internal LAN protection by isolating and safeguarding your critical assets from internal network threats while also providing remote VPN secure access.

[News ID 15800](#)

■ **ADLINK: rugged COM Express module supports SuperSpeed USB 3.0 and PCI Express Gen 3**

ADLINK released its latest Ampro by ADLINK Extreme Rugged COM Express module, the Express-IBR for airborne and vehicle-mounted military computers and human machine interfaces applications required to function in harsh environments. The Ampro by ADLINK Express-IBR is a COM Express Type 6 module that supports the quad-core and dual-core 3rd generation Intel Core i7 processors and Mobile Intel QM77 Express chipset. Following ADLINK's Rugged By Design methodology,

the Express-IBR is ideal for use in environments prone to severe shock, vibration, humidity, and extended temperature ranges.

[News ID 16096](#)

■ **NEXCOM: ruggedized vehicle mount computer increases workplace safety**

NEXCOM's 10.4" ruggedized vehicle mount computer VMC 3000 series is designed for use in heavy-duty vehicles and can increase productivity and safety within harsh environments. The VMC 3000 series features scalable computing power, 10.4" touch screen and various wireless communication technologies. Combining a robust design and IP65-compliant enclosure, the VMC 3000 series can gather, display, transmit and receive information to help optimize route planning, increase situational awareness, and monitor vehicle status. It is therefore ideal for use within a variety of rugged vehicles with locations such as construction sites, mines, quarries or warehouses.

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Box PC using USB as extension bus for I/O boards

By Daniel Piper, Kontron

For its intelligent communication and alarm server, Comron relies on modular Box PCs from the system integrator Aaronn. To achieve a cost-effective application design Aaronn uses Kontron's Pico-ITX motherboard enhanced with I/O boards connected via USB.



Figure 1. Application-ready communication server, pre-configured in an industrial aluminium chassis.

■ Today, there are a large range of technologies available for networking machines and equipments. In addition to fixed wiring connections via Ethernet or fixed line, wireless connecting technologies like WLAN or GSM nets are becoming more and more attractive, as they provide, for instance, connectivity regardless of location and without any additional wiring. Thanks to the permanent expansion of these networks and the increasing performance, new application areas are constantly popping up. One example is the event-driven transmission of data packets via SMS. Machines or dispensers can, for example, trigger stock-refilling, if sensors register stocks dropping below a certain threshold value. This application field is not exactly new, however thanks to SMS flatrates much more complex scenarios can nowadays be realized at significantly lower costs. It is therefore conceivable that a self-acknowledging control could be safely carried out via SMS. Not to mention the enormous potential that a wireless leased line via LTE could present. More and more new scenarios are being realized, i.e. for remote data collection and diagnosis or for remote access to fire alarm systems, facility management systems or unmanned systems.

Comron specializes in implementing intelligent communication and alarm solutions for these increasingly complex deployment scenarios.

The company portfolio features communication and alarm servers with a high degree of configurability for different application scenarios in the industrial market, building automation, security, health and energy supply industries. Due to the fact that the application requirements can be very varied, they are open to flexible configuration by the end-user: with analog and opto-isolated digital I/Os, serial interfaces or Wago I/O power-on. And the higher-level communication connections are just as flexible as the solutions are open to end-user configuration; all kinds of Ethernet and/or modems are supported. Thanks to the integrated flexibly configurable software solution from this company, this wide range of remote maintenance, telecontrol and diagnosis scenarios is possible, which adds convenience and reduces downtimes to a minimum.

A core competency is event-driven, rule-based communication processing. If faults occur, the communication server can inform the responsible maintenance personnel, for example, by issuing warning or error alerts via different individually configurable communication channels. For example, it is possible to distribute incoming messages and alerts to multiple destinations while taking different priorities, dates, schedules and requirements into account. Receivers can be, for instance, DECT or wireless LAN telephones, GSM devices, PCs, XML-

based end devices or central information servers. Signalling can be differentiated as user-oriented or event-oriented and carried out via pre-defined email or SMS texts to specific recipients or groups. Via a wide range of software protocols which Comron provides, the flexible support of a large number of telecommunication systems, fire alarm systems and control systems is guaranteed. Sirens, strobe lights or other alarm devices can be attached to the existing output contacts so that on-site alarm management can be carried out.

Initially Comron was looking for a Box PC platform for its own software solution so that they could implement their system solutions. To ensure low-maintenance operation in different environmental conditions in machinery and equipment, the Box PC had to provide fanless operation without moving parts, requiring an energy-efficient design. The demands on reliability were high too, therefore the company explicitly required a Box PC with a high mean time between failure (MTBF) which guaranteed long-term, trouble-free operation. A Box PC featuring embedded quality components was of great importance too with regard to long-term availability, so that, once in place, the design could remain unchanged for years to come and the procurement of spare parts ensured long-term availability.



Figure 2. Comron alarm server features a wide range of interfaces, via which incoming messages and alerts can be distributed to other devices taking different priorities, dates, schedules and requirements into account.



Figure 3. Kontron Pico-ITX Motherboard pITX-SP integrates Intel Atom processors and standard interfaces in a tiny footprint.

Furthermore, the Box PC dimensions had to be as compact as possible, so that installing it into machinery and equipment cabinets did not present a challenge. Flexible connectivity, however, was still a must. This requirement presented a particular challenge when it came to identifying the right hardware platform. Embedded Box PCs which were available in the market either had a highly dedicated range of interfaces which did not match the requirements, or the array of interfaces was so wide that the Box PCs had extra interfaces which had a negative effect on the system size, the costs and the energy consumption. The answer was to commission a custom design for the Box PC, to avoid any compromises having to be made. Comron looked for a specialist who could provide even small series at competitive prices while guaranteeing short development times for fast time-to-market. Comron found the answer at the system integrators, Aaronn.

Expansion modules with USB connectivity are particularly attractive as they can be connected to any motherboard with USB interface. And today, this already holds true for three performance generations. OEMs would therefore not need to design a new board for their I/Os when migrating from USB 1.1 to USB 2.0 or 3.0. The existing I/O hardware could continue to be used. A further aspect is the

amount of space needed for an I/O expansion board: as standard expansion components, ISA, PCI and PCI-Express need a considerably larger footprint on the CPU board than an embedded USB connector. So the ideal form factor for this individual expansion is the ultra-small Pico-ITX form factor.

The core of the MAS system from Comron is Kontron's Pico-ITX motherboard pITX-SP. The motherboard is especially suited for small appliances, because of its compact 2.5" Pico-ITX form factor (10 cm x 7.2 cm or 72 cm²). Included in the standard range of interfaces which are directly available on the board are GBit Ethernet, USB 2.0 and DVI. Aaronn implements all the further I/Os which Comron required on the customer-specific I/O board design which is connected to the Pico-ITX Motherboard internally via USB. By doing this, Aaronn guarantees a uniform system design even beyond the long-term availability of the motherboard, as the I/O module can easily be connected to future motherboards. By carefully selecting the components, the system integrator ensures the long-term availability of the I/O modules themselves, as well as Plug & Play driver support for different operating systems.

This combination of standard components and customer-specific expansion modules has saved Comron not only time and money compared to a full-custom design, the company further profits from the simplicity of creating different versions. Based on the same design, Aaronn has already built several different systems for Comron with different I/O versions. This was achieved by just adapting the USB module to fit the customer's requirements. So obviously, there are positive synergies for future designs with optional and varying CPU modules.

Customers further profit from the proximity of value adding resellers (VAR) like Aaronn to their customers and their particular portfolio. The system integrator is in a position to produce smaller lot sizes in the shortest period of time without having to wait for larger batches to be ordered. To achieve this, Aaronn keeps the Box PCs in stock and can offer Comron better purchasing conditions than if they were to buy directly. This design concept is attractive for a large number of solution providers especially due to the high level of standardization and enormous flexibility with the I/Os. New Box PC designs can thus be brought to market at great speed and with maximum cost-efficiency. ■

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Connecting the “smart” in smart grid

By Jenny Shepperd, Eurotech

Companies need to deploy embedded technologies to ensure the growth and viability of the smart grid. Connecting it with cellular technologies assists in creating an advanced network of real-time electricity information. This will help grid operators better anticipate where problems might develop and enable them to precisely manage the grid with real-time information.

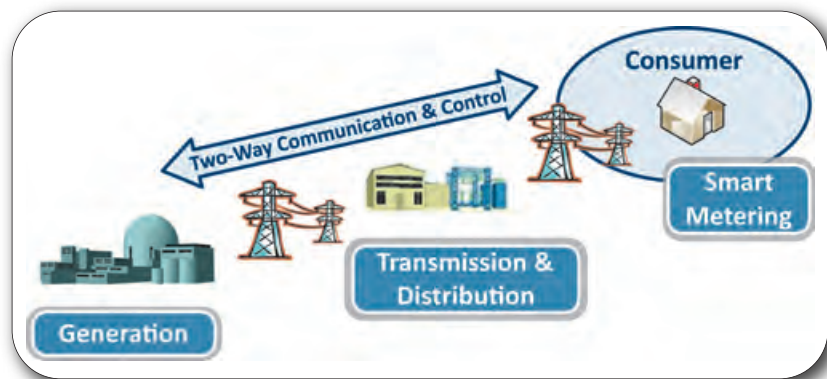


Figure 1. Simplified illustration of the smart grid

■ The smart grid delivers electricity from suppliers to consumers using digital technology to save energy, reduce costs, and increase reliability and transparency. To ensure the growth and viability of the smart grid, companies must successfully deploy embedded technologies with reliable and low-cost two-way communications. Cellular networks have become the common solution for an easily deployed, ubiquitous network. Effectively incorporating cellular technologies into embedded solutions is the foundation for connecting the smart grid. The smart grid comprises several end-to-end operational components connecting power-generation plants to consumers. The full value of the smart grid will eventually be realized by integrating the technology behind every component to merge data for a complete view of load management and control. Figure 1 shows a simplified illustration of the smart grid.

Electricity generation, transmission, and distribution are automated based on calculated demand derived from monitoring usage and adjusting the electric supply from generators. However, the smart grid of the future is self-sustaining and self-correcting as electricity travels between the supplier and the consumer, balancing flow in real time while offering consumers greater control of their energy use. The top rationales for smart grid implementation are to establish connectivity, enable smart meters, simplify operations, and reduce costs for power companies and consumers. Due to the typical hub-and-spoke topology, the tech-

nology selected for use at a concentrator site that connects to a geographical area of smart meters is important. These networks consist of spread spectrum radio, private RF, power line carrier, mesh networking, and other technologies that allow for real-time connectivity and control. These technologies do not require monthly fees and are generally a fixed-cost solution, with ongoing maintenance requiring little construction and build-out.

The second area of focus is the communication that transpires during the handoff to the grid at the gateway, edge controller, or concentrator. The design is crucial to system performance, and costs must simultaneously be minimized to make the smart grid viable. These communications must be two-way, based on open standards, secure, low cost, easy to deploy, and ubiquitous. If there is no communication backbone available from a local substation or a stub on a private network, other technologies meet the requirements, including DSL or cable modem, IP radio, and cellular. DSL or cable modems work but pose some problems with uptime and reliability.

Cost is also an issue, and both require copper or cable connectivity to run to the endpoint, which can entail costly trenching and right-of-way issues for installation. IP radio is another option, but installing towers is expensive and maintenance costs are high. Cellular communication is the ideal choice for ubiquitous IP networking, with simple installation and

low maintenance costs. Cellular coverage is excellent because it corresponds to population concentrations, meaning there is power where there are people. Advances in IP cellular technology, and competitive pricing among carriers as an expanding revenue stream aside from voice communication, create an ideal environment for the smart grid. The smart grid typically combines the last mile of connectivity to smart meters through a private radio network into the edge gateway, providing the entry point to the cellular networks, as depicted in figure 2.

Several important factors must be considered when choosing the correct hardware path to design a smart grid system with cellular technologies. Whereas making the best selection of cellular technology leads to long product life cycles and shortened deployment time, making a mistake leads to potential redesigns and expensive cellular network certifications that delay system development. Cellular networks consist of several technologies with their own limitations or features. GSM and CDMA are two current platforms to consider, each with multiple technology implementations based on their development over time increasing throughput. Data throughput needs in the smart grid are relatively low, but designers must consider longevity, device management, and scaling the solution if data needs grow. From a cost standpoint the greater the speed and latest technology, the higher is the initial cost of the hardware.

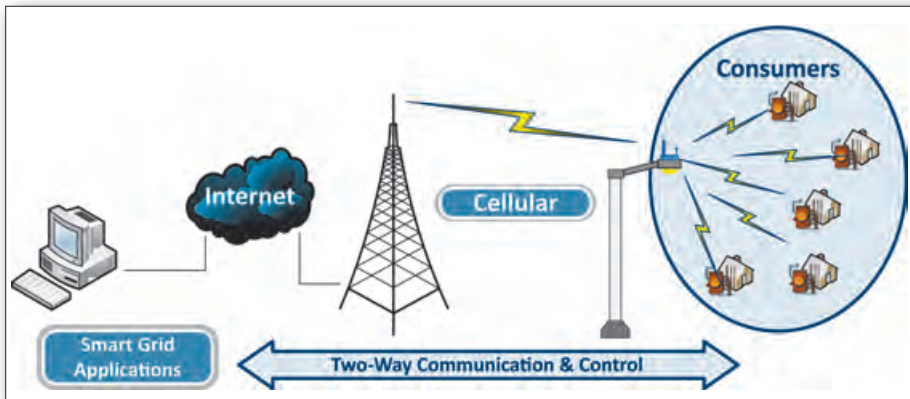


Figure 2. The smart grid typically combines the last mile of connectivity to smart meters through a private radio network into the edge gateway.

Connecting the smart grid with cellular technologies assists in creating an advanced network of real-time electricity information. Digitally automating the entire power supply system makes the grid more reliable and efficient. Cellular technology will help grid operators better anticipate where problems might develop and enable them to precisely manage the grid with real-time information.

For over 20 years Eurotech have supplied products for power grids, pipeline monitoring, automatic meter reading, telemetry and SCADA

requirements. Each of these industries has unique requirements with diverse use of communication technologies, networking and protocols. Eurotech delivers the hardware and software platform solutions for these markets to securely control and manage data and mission critical assets. For energy solutions, the company offers a wide range of tried and tested rugged, industrial hardware along with its Everyware Device Cloud – a Cloud-based device management and data delivery solution offering customers an even more efficient way to run their businesses. ■

Product News

■ NORCO: 1U 6 LAN network security barebone with Intel H61 chipset

With the coming of "Cloud Computing" era, network needs to handle enormous data streams and with the growing mobility, attacks on networks are also on the rise. Data security/ server security and network access control are becoming the priorities of network security applications. To address these challenges, NORCO is working with Intel to develop the right solution that you seek. NORCO FW-1109 and FW-2108 feature multiple Ethernet ports with high networking bandwidth throughput, powerful core logic computing capability through the processor, and a friendly management interface, perfect solution to the network security platforms used in a such fiels as banking, operators, government, police, education, enery, tax administration, industry and commerce agency, social security, hygiene, business, etc.

[News ID 15849](#)

■ IEI: advanced auto data server with upgraded surveillance function

IEIMobile, the branded mobile solution provider established by IEI Technology, announced the launch of the AVL-3000, a highly integrated auto data server designed for advanced vehicle and asset management applications. The AVL-3000 includes various features such as the Intel

Atom N2600 1.6GHz CPU, Windows 7 OS, Wi-Fi, Bluetooth, HSUPA/GPRS/GSM, GPS, and On-Board Diagnostics technologies.

[News ID 16095](#)

■ Axiomtek: fanless desktop network appliance with Atom D525 and 6 Gigabit LANs

Axiomtek introduces the NA-340FL, a new 1U-type fanless network appliance platform based on Intel Atom processor D525 dual core at 1.8 GHz with Intel ICH8M chipset for SOHO markets. Six Gigabit Ethernet ports are integrated into this unit with one pair supporting LAN bypass function.

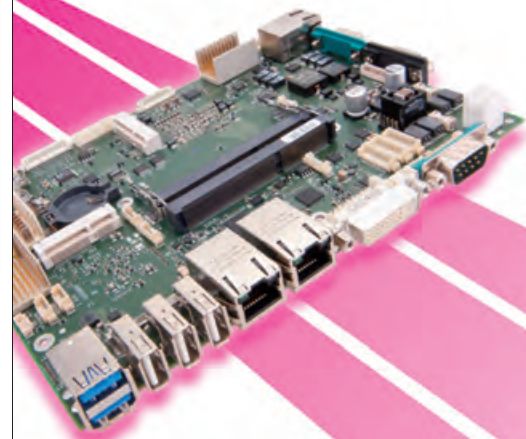
[News ID 16038](#)

■ Schroff: brochure presents high-tech-products for telecommunications

Pentair Technical Products, with its brands Hoffman, Schroff, McLean, Birtcher and Calmark, is presenting its custom solutions for the telecommunications sector in a new 24-page brochure. This documents the entire palette of products, components and services for core, metro, access and company applications. Starting from a description of the product platforms for AdvancedTCA, MicroTCA and CompactPCI, the brochure then shows all further products, together with integrated custom and standard solutions.

[News ID 16109](#)

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■ **DDC: real-time LabWindows / LabVIEW MIL-STD-1553 & ARINC 429 support**

Data Device Corporation adds a boost of real-time LabWindows/CVI and LabVIEW functionality to its powerful and already popular LabVIEW support package. With DDC's newly expanded BU-69093 LabWindows / LabVIEW real-time support package engineers can now easily integrate MIL-STD-1553 and ARINC 429 hardware and software solutions ensuring the utmost data integrity while saving valuable time, effort, and cost.

[News ID 16030](#)

■ **Wind River's software and tools available on Fastwel mission-critical hardware**

Wind River announced that Fastwel has become a member of the Wind River Partner Alliance Program. The partnership will provide robust, application-ready platforms to Fastwel customers around the world within a cross-section of sectors, including aerospace and defence, industrial and transportation. Through this collaboration, Fastwel can now ship board support packages for Wind River VxWorks that enable customers to easily use Fastwel hardware with Wind River products.

[News ID 15816](#)

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■ **Green Hills: functional safety portfolio optimised to new Freescale PX MCUs**

Green Hills Software has announced a strategic partnership with Freescale Semiconductor to offer optimised products and services for developers of functional safety and general-purpose applications on the PX series of micro-controllers. Manufacturers of industrial, avionics, railway and medical devices now have the freedom to choose from a range of silicon, software and safety architecture services that best match their technical and business goals.

[News ID 15825](#)

■ **Kontron brings 3rd generation Intel Core to CompactPCI 6U boards**

Kontron announced the new 6U CompactPCI processor board CP6004-SA based on the Intel QM77 Express Chipset and scalable up to the quad-core 3rd generation Intel Core i7-3615QE processor with 4 x 2.3 GHz (3.3 GHz in Turbo mode) the new boards provide up to 20% enhanced computing power and increased performance per watt compared to designs based on the 2nd generation Intel Core processors.

[News ID 15765](#)

■ **Intel launches digital signage evaluation kit**

Intel announced the next-generation Digital Signage Evaluation Kit-12 (DSEK-12) designed to streamline the digital signage evaluation process, reduce costs and enable faster deployment across a range of market segments including retail, healthcare and transportation. The DSEK-12 features technologies from Intel, Kontron and Microsoft in a pre-loaded and validated system.

[News ID 16103](#)

■ **DSM: fire-load test certificate for large-sized industrial displays**

DSM Computer offers for its ABLE industrial displays a fire-load calculation conducted by an independent expert. An appropriate test certificate can be made available on request. This allows the professional display systems also to be deployed in public buildings and halls because architects normally request this calculation or certificate for public tenders. The term fire load (also fire loading) is used in conjunction with the safety technology for buildings and the required fire protection.

[News ID 15980](#)

■ **KW Software: Safety Alliance starts into the future of safety technology**

The first general membership assembly of the Safety Alliance was held on June 11, 2012, in Frankfurt/Main. Representatives of the seven founding members decided the next steps towards the further development of the open technology platform for functional safety. The

cooperation will focus in particular on hardware architectures, software validation and the future of safe programming.

[News ID 15844](#)

■ **MSC: type 6 COM Express modules and evaluation board**

MSC has added two new, performance-enhanced, cost-optimized modules to its high-performance MSC C6B-7S COM Express module product line-up. The compact embedded modules feature an integrated Dual-Core Intel Celeron 847E processor with 1.1 GHz or a Single-Core Intel Celeron 827E processor (1.4 GHz). Both modules comply with the type 6 pin-out of the current COM Express standard and support two independent displays.

[News ID 16078](#)

■ **MSC: starter kit for COM Express type 6 modules**

MSC presents its innovative starter kit for COM Express Type 6 modules which represents a complete, ready-to-run environment for this new range of Computer-on-Module with the latest interface standard. The kit contains a COM Express Type 6 baseboard, a heat sink with fan and two 4-Gbyte DDR3 memory modules. Users of the kit are free to choose any suitable COM Express Type 6 computer module from MSC's growing portfolio.

[News ID 15955](#)

■ **GE: rugged COM Express module for multi-display applications**

GE Intelligent Platforms announced the latest addition to its growing range of COM Express modules with the launch of its highest performance offering to date, the rugged bCOM6-L1400. Taking advantage of the significant processing and graphics capabilities of the recently-announced Intel Core i7 processor, the bCOM6-L1400 can support multiple independent displays in a wide variety of commercial, industrial, transportation and defense applications in a broad range of embedded computing environments.

[News ID 15957](#)

■ **X-ES: 6U CompactPCI SBC targets Freescale eight-core P4080 processor**

Extreme Engineering Solutions introduces the XCalibur1600, a 6U CompactPCI Single Board Computer supporting Freescale QorIQ P4080 processor. Available in either conduction- or air-cooled versions, the XCalibur1600 utilizes the eight Power Architecture e500mc cores running at up to 1.5 The SBC comes with up to 16 GB of DDR3-1333 ECC SDRAM in two channels, up to 512 MB of NOR flash (with redundancy), up to 64 GB of CPU NAND flash and up to 128 GB of SATA NAND flash (optional).

[News ID 15780](#)

■ **DFI: AMD Embedded G-Series APU-based COM Express Compact modules**

DFI's new COM Express Compact module, the OT905-B series, is powered by the dual-core AMD Embedded G-series APUs. The graphics-rich modules come available in 2 models. The OT905-BT56N uses the AMD T56N APU while OT905-BT40N uses the T40N APU with power consumption of 18W TDP and 9W TDP respectively. The dual-core G-series processors offer high performance at low power consumption and supports up to 8GB DDR3 system memory.

[News ID 15965](#)

■ **DFI: low power Mini-ITX supports 3rd gen Intel Core processors**

DFI brings the mobile-based 3rd generation Intel Core processor to the CR100-CRM Mini-ITX embedded board. It is DFI's first Mini-ITX board supporting the new mobile Intel QM77 Express chipset. The integrated next-generation Intel HD Graphics 4000 engine delivers up to 50% 3D graphics performance improvement and up to 1.8x HD to HD transcode performance increase. The available graphics interfaces can simultaneously display high definition images in 3 independent displays.

[News ID 16033](#)

■ **SECO announces NVIDIA CUDA on ARM Development Kit**

SECO announces that the NVIDIA CUDA on ARM Development Kit, codename CARMA DevKit, is now available to order. The CARMA DevKit is designed to support the growing demand for computing initiatives around the world for all developers looking to create energy-efficient high-performance computing solutions with ARM architecture. The CARMA DevKit features the NVIDIA Tegra 3 Quad-core ARM A9 CPU and the NVIDIA Quadro 1000M GPU with 96 CUDA cores.

[News ID 15772](#)

■ **ECRIN: small form factor rugged control unit for Mil/Aero**

ECRIN Systems has chosen the Eurosatory 2012 event to introduce, on the Mil/Aero market, ONYX series: a small form factor rugged control unit SWaP-C compliant for UVS, UAS, manned aircraft and C4ISR apps. Based on extreme rugged COM Express Core i7 2nd or 3rd Gen Ivy bridge, it offers, via MXC mezzanine option, high graphic and high computing GP-GPU Radeon E6760 performance (480 Cores for 576GFLOPS) with long life management of 5 years. No NRE, no cable, very flexible, this new entry range SFF rugged computer unit operates between -40 and +70°C and has been qualified for MIL-STD-810, DO-160, MIL-STD-461 and MIL-STD-1275 environmental conditions.

[News ID 15732](#)

■ **MSC: Qseven module with media processor for imaging applications**

MSC announces their compact Qseven MSC Q7-TI8168 module in a new, higher-performance variant with a DaVinci DM8168 digital media processor by TI. The processor integrates an ARM Cortex-A8 RISC MPU (up to 1.5 GHz), the C674x Floating Point VLIW digital signal processor with up to 8000 MIPS and 6000 MFLOPS, as well as video and graphics accelerators. The DaVinci DM8168 digital media processor processes up to three 1080p 60 fps video streams simultaneously and is perfectly suited for multichannel HD video monitoring systems, video conference systems and media hubs and servers.

[News ID 16058](#)

■ **Curtiss-Wright: rugged Kintex FPGA-based digital I/O XMC card**

Curtiss-Wright has announced the XF07-523 Digital I/O XMC, the first member of a new family of Xilinx Kintex-7 FPGA based XMC cards for high-end defense and aerospace applications. The XF07-523 provides direct FPGA driven LVDS I/O through the front panel and PMC/XMC connectors for rear I/O on a fully ruggedized XMC module designed to perform optimally in the harshest conditions including +85C card edge conduction-cooled solutions.

[News ID 16106](#)

■ **NAT: processor AMC based on Freescale multi-core QorIQ P3041**

Based on Freescale multicore QorIQ P3041 the single-width mid- or full-size AdvancedMC processor board NAMC-QorIQ-P3041 is targeting combined control and dataplane processing applications with the demand for storage capability. Due to its performance and scalability the board also suits time critical data processing applications, i.e. for imaging and control. The NAMC-QorIQ-P3041 addresses the need of a more cost-efficient solution compared to the P40 and P50 family members. Dual SATA ports provide high-speed, low-cost storage options for statistics or large databases.

[News ID 16111](#)

■ **MicroSys: integrated platform for control and HMI applications**

MicroSys implements customer specific control and HMI devices rapidly, for rugged and harsh environments, if needed. Certification and SW services and long term supply is provided as additional offering. Basis is the wide spectrum of miriac MPX System on Modules and SBCs utilizing Freescales Power Architecture/QorIQ, ARM Cortex and X86/Intel Atom CPUs. The miriac HMI1022 HMI device carries Freescale QorIQ CPUs in combination with miriacMPX SoMs. In the current version it is a P1022 CPU.

[News ID 15954](#)



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■ **Acrosser: fanless Panel PC for HMI and industrial automation**

Acrosser introduces the industrial-grade fanless Panel PC AR-P190FLDC-D52 with Intel Dual Core Atom D525 CPU and Intel ICH8M platform, front panel IP65 and fan-less operation. AR-P190FLDC-D52 has features such as touch screen, 19-inch TFT LCD monitor of 1280x1024 resolution, built-in DDR3-800 2GB SO-DIMMs, 320GB 2.5-inch hard drives, internal / external CF slot. 1 x RS232 port, 1 x RS422/485 port, 4 x USB ports and two RJ45 network connectors.

[News ID 15943](#)

■ **Concurrent releases board level security package**

Concurrent Technologies announces the release of their Board Level Security Package for use with their latest processor boards. This package is a comprehensive set of hardware, firmware and software features designed to aid their customers to deliver secure embedded solutions into applications where protecting critical technologies and data is mandatory. The primary line of defense against unauthorized access to equipment handling sensitive data is always the physical security of the chassis.

[News ID 15712](#)

■ **GE expands range of application-ready COTS rugged systems**

GE's COTS Rugged Systems family now comprises eight packaged, pre-validated, ready-to-run rugged data/processing control computer systems for a broad range of military and commercial applications. Typical use examples include civilian and military unmanned vehicles, manned commercial and military aircraft, helicopters, over- and underwater research vessels, ground vehicles, locomotives and oil and gas applications.

[News ID 15792](#)

■ **VersaLogic: embedded SBC powered by 3rd gen Intel Core processor**

VersaLogic has announced Copperhead, an embedded SBC powered by a 3rd Generation Intel Core processor. Its performance level, combined with the high-speed PCIe expansion site, enables the integration of complex high-bandwidth functions, such as digital signal processing and video processing. Based on the industry-standard EBX format, Copperhead's numerous next-generation I/O interfaces, thermal solutions, and real-world connectors work to remove system design limitations.

[News ID 15746](#)

■ **Advantech: green design concept for all panel products**

Advantech announces that its PPC-L128 Panel PC has received a 'Product Carbon Footprint Certification Statement' from the China Environmental Certification Center, Ministry of Environmental Protection. PPC products will gradually adopt green design concepts throughout the product line.

Environmental Certification Center, Ministry of Environmental Protection. PPC products will gradually adopt green design concepts throughout the product line.

[News ID 16131](#)

■ **DSM: Industrial display systems with 2nd gen Intel Core processor**

DSM Computer's new large-area ABLE industrial display systems offer increased dust protection and are protected against spray water in accordance with the IP44 degree of protection. For deployment in public buildings, a fire-load calculation is also available for the industrial display systems. The robust displays are currently available in three variants with screen diagonal sizes of 140 cm, 119 cm and 107 cm.

[News ID 15831](#)

■ **NEXCOM: PICMG 1.3 SBC for use in severe environments**

NEXCOM's PEAK 886 PICMG 1.3 full-size single board computer is based on the 3rd generation Intel Core processor family paired Intel Q77 Express chipset. PEAK 886 integrated with Intel HD Graphics 4000 shows a huge increase in performance per watt, imaging processing capabilities, I/O bandwidth and data security. With high scalability and flexible expansion, PEAK 886 meets different levels of performance demand for applications such as factory automation, AOI, medical imaging and video surveillance.

[News ID 15904](#)

■ **Kontron: Mini-ITX motherboard with NVIDIA Tegra 3 processor**

As part of Kontron's strategic entry into ARM processor technology, Kontron has unveiled its first embedded ARM based motherboard in the Mini-ITX form factor. The Kontron KTT30/mITX is based on the NVIDIA Tegra 3 processor with four ARM Cortex-A9 CPU cores each with up to 900 MHz. An additional core with up to 500 MHz clock speed reduces power consumption to less than 1 watt in phases, when just media playback or background services are running.

[News ID 15867](#)

■ **VITA: check tools test multi-vendor FMC daughter card and carrier card interoperability**

VITA, the trade association for open standard computing architectures serving critical embedded systems industries and the FMC Marketing Alliance announce the successful completion of FMC PlugFest 2012. The PlugFest was the first utilization of FMC Check which consists of the VITA 57.2 metadata specification combined with Cloud-based builder and checker tools.

[News ID 16069](#)

boards & solutions

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■ **ELMA packs maximum performance into 1 U form factor**

The trend towards downsizing on the embedded market does also work for 19"-systems: The only 1 U high system platform "blu!one" is currently the most sought-after product of the ELMA blu!-series of the Pforzheim system manufacturer ELMA Electronic. The MicroTCA-dwarf blu!one, provided traditionally in a blue case like all ELMA MicroTCA-systems, offers highest performance in the smallest possible 19"-form factor.

[News ID 15910](#)

■ **IBASE: dual-HDMI signage player for Intel Core i processors**

IBASE releases the SI-56, a mid-range digital signage player designed for Intel's 2nd generation Core i7/i5/i3 processors with integrated Intel HD Graphics 3000. With increased frequency compared with previous generation HD Graphics, the new graphics core supports OpenGL 3.0, Shader Model 4.1 and DirectX 10.1 standards, as well as full-HD video with the player's dual HDMI connections.

[News ID 15914](#)

■ **iWave: Windows Embedded Compact 7 reference BSP for Q7 compatible module**

iWave Systems announces the availability of Windows Embedded Compact 7 reference BSP for Q7 compatible i.MX6 System-On-Module besides the existing Linux 3.0.15 & Android ICS 4.0 BSP versions. All the latest features that WEC7 offers such as Silverlight 3.0, Connect and Consumer Media, MPEG-4 HD, MTP, Multi-Touch, Expression Blend, Active Sync and also Adobe Flash10.1 are made available.

[News ID 15959](#)

■ **VersaLogic launches new family of embedded computers**

VersaLogic announces Falcon, a small, rugged, embedded computer. The new Embedded Processing Unit format combines processor, memory, video, and system I/O into an extremely compact embedded computer. The Falcon features an Intel Atom E6x0T processor which is optimized for performance / power consumption balance. It provides compatibility with a broad range of x86 application development tools for reduced cost and development time.

[News ID 15995](#)

■ **DDC: high performance and programmable 38 channel ARINC 429/717 cards**

Data Device Corporation introduces a new line of ARINC 429/717 cards offering the most advanced test features with individually programmable Transmit/Receive ARINC channels, allowing one card to support all levels of testing and simulation. DDC's DD-40X00X series of cards offer up to 36 ARINC 429 programmable Tx/Rx channels, 2 ARINC 717 programmable Tx/Rx channels, parametric test functionality, variable output voltage, and on board voltage monitoring.

[News ID 16011](#)

■ **IBASE: ATX motherboard with 3rd gen Intel Core processors and Q77 Express chipset**

IBASE Technology releases a new MB970 ATX motherboard with the 3rd generation Intel Core processor and Intel Q77 Express chipset platform to provide the ideal solution for a diverse range of applications such as Gaming, POS, Kiosk, ATM, Multimedia and Digital Signage. In addition to the multiple displays, the MB970 comes with four DDR3 DIMMs that support up to 32GB.

[News ID 15735](#)

■ **Kontron: Mini-ITX motherboard with NVIDIA Tegra 3 processor**

As part of Kontron's strategic entry into ARM processor technology, Kontron has unveiled its first embedded ARM based motherboard in the Mini-ITX form factor. The Kontron KTT30/mITX is based on the NVIDIA Tegra 3 processor with four ARM Cortex-A9 CPU cores each with up to 900 MHz. An additional core with up to 500 MHz clock speed reduces power consumption to less than 1 watt in phases, when just media playback or background services are running.

[News ID 15867](#)

■ **NEXCOM: digital signage player can support up to three independent displays**

NEXCOM has rolled out the 1080P digital signage player NDiS 167 in light of booming demand for embedded intelligence. Performance, connectivity, manageability are three important pillars of embedded intelligence. NDiS 167 based on the 3rd generation Intel Core processor family paired with Mobile Intel QM77 Express chipset lays great emphasis on these attributes and is poised to inject new life into versatile multimedia applications.

[News ID 15736](#)

■ **MEN: certification package for SIL 4 certified 6U VMEbus or cPCI SBCs**

For usage in railway applications MEN's A602 and D602 6U VMEbus and CompactPCI single board computers boasting extreme functional safety can now be accompanied by a certification package. In the package, MEN provides all relevant documents which make it easier to certify the complete system according to EN 50126 and EN 50129 with the responsible authority.

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■ **IEI: EPIC SBC supports 3rd gen Intel Core processors and QM77 Express chipset**

IEI Technology has launched the NANO-QM770, an EPIC SBC supporting the 22nm LGA1155 3rd generation Intel Core processor family and Mobile Intel QM77 Express Chipset. 3D micro-architecture enhancement supported by the Intel HD Graphics engine allows the NANO-QM770 to deliver enhanced graphics performance. The NANO-QM770 is the ideal platforms for high performance surveillance systems, energy control systems, and high-resolution digital signage applications.
[News ID 16044](#)

■ **BVM: 3.5 inch embedded SBC supports single and dual core Celeron processors**

The LE-37A is the latest embedded single board computer to be added to the BVM Group's range of small form factor (146 x 101mm) devices. Its small dimensions enable a powerful computer to be incorporated in physically small systems. The LE-37A is based on the HM65 chipset, accepts three 32nm technology Celeron processors and supports up to 8GB of 1066/1333 DRAM. The dual core 17W TDP 1.1GHz 847E, the single core 17W TDP 1.4GHz 827E and the dual core 10W TDP 1.0GHz 807UE can all be specified.
[News ID 16027](#)

■ **DDC: new 3-D models for SFF USB and Mini-PCIe boards**

Data Device Corporation releases 3-D models for its new MIL-STD-1553 small form factor BU-67113U USB and BU-67114H mini-PCIe boards to enable engineers to conduct an exact fit analysis and begin to integrate the boards into their embedded system or laptop computer design without the need to have any physical hardware present. These 3-D SolidWorks models greatly streamline the integration process by providing engineers with precise component dimension and location information for maximum design accuracy and efficiency. Benefits include reduced integration time, detailed fit analysis and quicker time-to-market.
[News ID 15888](#)

■ **VIA: ARM-based Pico-ITX board for industrial and in-vehicle**

VIA Technologies announced the VAB-800 Pico-ITX embedded ARM board. Featuring a choice of an 800MHz or a 1GHz Freescale ARM Cortex-A8 processor, the VIA VAB-800 combines a wide operating temperature range with extremely low power consumption to meet the demands of high-end industrial and

in-vehicle fanless embedded applications. Based on the industry standard 10 x 7.2 cm Pico-ITX form factor created by VIA, the VIA VAB-800 Pico-ITX board combines a rich I/O set with superb multimedia performance, supporting playback of the most demanding video formats in resolutions up to 1080p.
[News ID 15946](#)

■ **Vecow: extended temperature fanless Quad-Core i7 embedded vision controller**

Vecow announces the ECS-5600-3V, a high-performance fanless embedded vision controller with 2nd Gen Intel Core i7-2710QE Processor (6M Cache, up to 3.00 GHz) and maximum dual channel 16GB ram and provides 4CH 120/100 fps video capture capacity, 3 GbE LANs, DVI-D/HDMI and VGA dual display, CFast, two 2.5" SATA 6Gp/s HDD/SSDs, 2 miniPCI-express with SIM card supports for WiFi, 3G/GPRS, and 2 eSATA ports, plus with industrial fanless thermal and housing placemen for -25 to +70 °C operating temperature range.
[News ID 15827](#)

■ **Kane: PCIe x 8 (Gen3) computational accelerator board based on Altera Stratix V**

Kane Computing have announced that the Gidel ProcV PCIe x 8 (Gen3) computational accelerator board is now in production and will be available in September 2012. The ProceV system is based on Altera's newest generation Stratix V FPGA device. The ProceV provides massive capacity (up to 952K LEs), and high memory and I/O performance. Thirty-four 12.5 Gb/s transceivers provide external IOs of up to 389 Gb/s.
[News ID 15824](#)

■ **Kontron achieves International Railway Industry Standard certification**

Kontron announced that it has achieved the IRIS (International Railway Industry Standard) Revision 02 certification, a compliance developed by the independent association of European railway industries UNIFE. The IRIS certification attests that Kontron complies with international unified quality standards and fulfills the highest demands for reliability and lifecycle management of the railway industry.
[News ID 16091](#)

■ **BVM: second gen i7/i5/i3 Sandy Bridge CPU on Micro ATX motherboard**

The MS-C73 is the latest addition to The BVM Group's comprehensive family of indus-

trial grade motherboards. The Micro ATX form factor motherboard has two PCI and two PCIe slots for expansion cards and the platform delivers higher performance and improved energy efficiency in a secure and manageable operating environment. Combining low power with high performance, the unit is based on the Intel Mobile QM67 chipset managing Intel Sandy Bridge second-generation 32nm Core i7/i5/i3 Celeron Mobile processors in the rPGA988B socket.
[News ID 15876](#)

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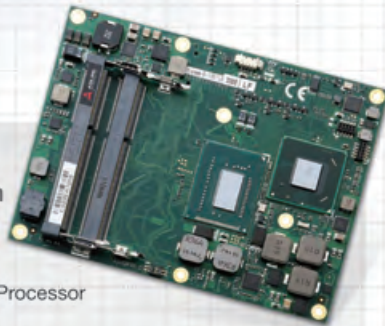
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Express-CB/CBE

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- Intel® QM57 chipset
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- Six PCIe x1, one PCIe x16 for graphics (or general purpose x8/4/1)
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