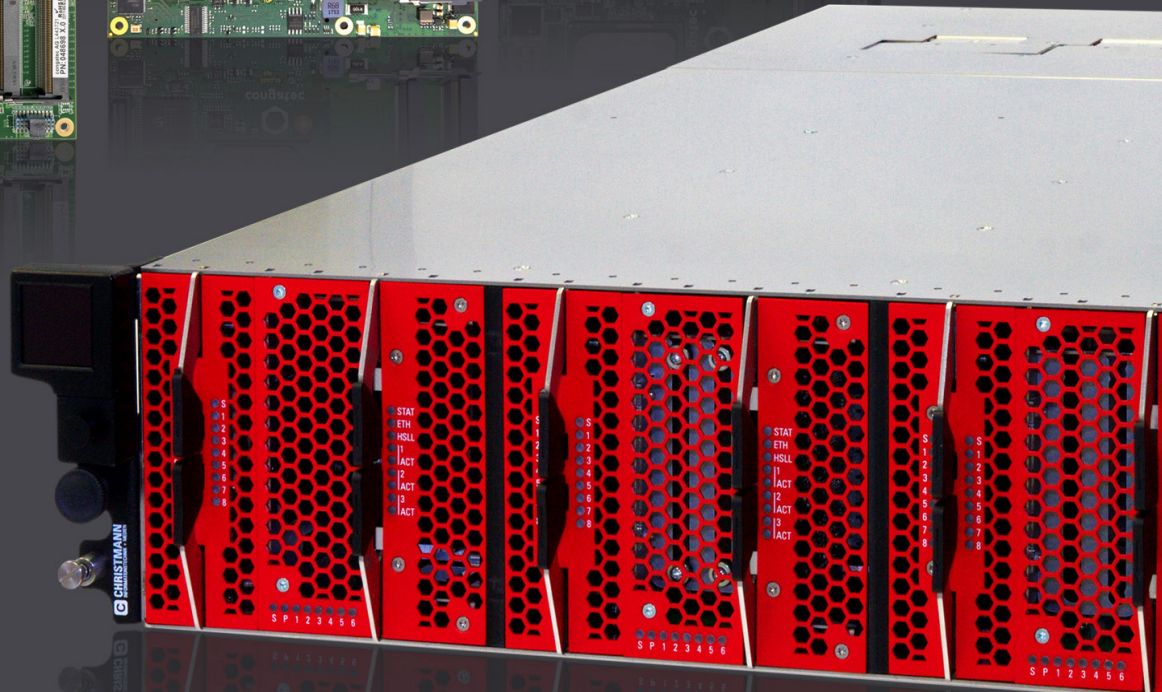
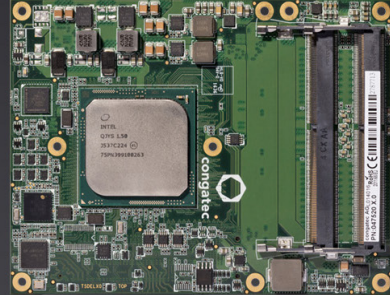
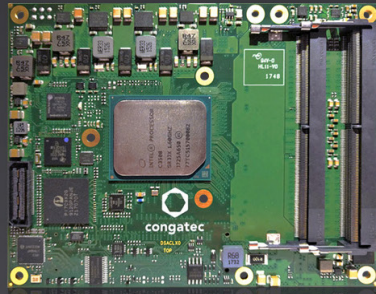
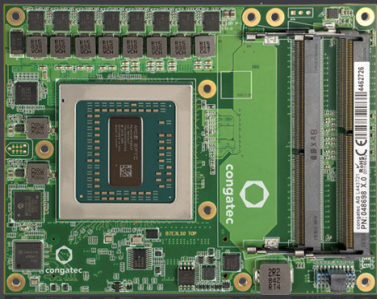




congatec



Case study

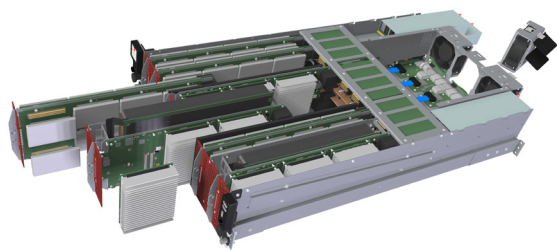
PERFORMANCE UPGRADES AT ABOUT HALF THE INITIAL INVESTMENT

Cutting the cost of performance upgrades with Server-on-Modules

Performance upgrades at about half the initial investment

The performance race for server technologies is far from over. However, investing in data center services time and again costs money – more than actually necessary. The use of alternative standardized processor modules can drastically cut these costs. For its microservers, Christmann therefore relies on Congatec Server-on-Modules based on the vendor-independent COM Express Type 7 standard. After three to five years, a second generation is expected to cost only about 50% of the initial investment, as a simple replacement of the processor modules will be all that's required in the majority of cases.

It is not only the telecoms market that is struggling with the fact that revenues per Gigabit of data transfer are constantly falling, while performance requirements are constantly rising – despite the given TDP spectrum of each server rack. The same applies to data center operators as well as on-premise cloud and server applications, and even more so in the industrial server and energy-sensitive microserver segment, where space is often much more limited. Here too, Internet, IIoT and Industry 4.0 connected installations must manage increasingly complex challenges, such as image data recognition using artificial intelligence, without the option to scale the available server space in the control cabinet rack of



This Christmann 3U rackmount system can host up to 27 high-performance microservers. Each carrier blade uses up to 3 COM Express Type 7 Server-on-Modules from Congatec.

machines or systems in often harsh environments. This makes it necessary to pack more and more performance onto the same microserver footprint without any additional thermal design scope.

When installing a new generation of microservers, it is already clear that the next generation will have to follow within three to five years in order to keep pace with requirements. But how can this next performance upgrade be implemented as cost-effectively as possible? German IT company Christmann has taken an innovative approach here. As far as research has found, it is the first company in the world to utilize the new COM Express standard for Server-on-Modules to develop a new generation of modular 2U and 3U rackmount servers as part of the EU-funded M2DC project launched in 2016. The rackmount servers can be flexibly equipped with up to 27 CPU microservers with x86 or ARM architecture. In addition, they also offer standardized modular options for parallel processing in the form of GPGPU cards and FPGA modules, which the company also physically implements in a COM Express Basic footprint.

The objective of the M2DC project is to develop tailor-made, commercial off-the-shelf (COTS) hardware that can meet all the requirements of future high-performance applications – from cost-effective cloud designs to ultra-efficient hardware-accelerated supercomputers. This entails that all different computing architectures should be freely combinable in one housing. A modular approach was therefore required from the outset in order to provide the right COTS solution for every need without engineering effort – even for heterogeneous designs.

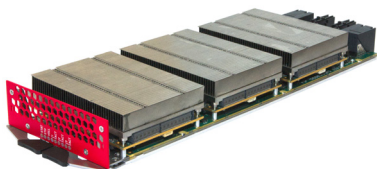
At the same time, the new class of 2U and 3U rackmount servers had to provide the lowest possible investment costs and sustainably high energy efficiency. Modular designs provide the appropriate foundation in this respect, too, because it is well known that the next generation of microserver processor technology also enables a new performance leap with the same TDP. When the only task is to replace the microserver module, performance leaps are possible for a given a TDP at a minimum investment. Based on its own calculations, Christmann estimates that costs for migrating to a second generation amount to only about 50%, including all services that must be provided for new configurations, qualification and installation. When applying these costs, for example, to three innovation cycles, total investment is reduced to about two-thirds (200%/300%).



The standard 2U system design includes three carrier blades that can be equipped with COM Express microserver modules from congatec – in combination with FPGA and ARM modules, if required.

Module	Print-out Type	Processors	Cores/Threads (max)	RAM (max)	PCIe Lanes	Graphics	TDP (max)
conga-B7XD	7	Intel® Xeon® D1500 / Intel® Pentium D1500	16 / 32	48 GB DDR4 2400 ECC	24x PCIe Gen 2.0, 8x PCIe Gen 2.0	-	65 W – 19 W
conga-B7AC	7	Intel® Atom® C3000	16 / 16	96 GB DDR4 2400 ECC	12x PCIe Gen 3.0, 8x PCIe Gen 2.0	-	31 W – 11 W
conga-TS370	6	Intel® Xeon® E-2100M / 8. Gen Intel® Core™ i7,i5	6 / 12	32 GB DDR4 2666 ECC	24x PCIe Gen 3.0	Intel® Gen9 UHD	45 W - 35 W
conga-TS175	6	Intel® Xeon® E3 / 7. Gen Intel® Core™ i7,i5,i3	4 / 8	32 GB DDR4 2666 ECC	24x PCIe Gen 3.0	Intel® HD630	45 W – 25 W

The modular concept makes the Christmann RECS Box 4.0 server family extremely scalable in terms of processor performance as it can host both COM Express Type 6 and COM Express Type 7 modules. This allows a flexible module choice, ranging from simple Intel Atom C3000 processor modules to Intel Xeon D1500 processors. Thanks to coded plug contacts, the Christmann blade carrier can automatically detect whether a COM Express Type 7 or a COM Express Type 6 module has been plugged in and adjust the routing to the backplane accordingly. This simplifies module replacement considerably. Since Christmann has used the COM Express footprint also for ARM and FPGA modules, mixed configurations can be implemented on a single blade carrier. And as GPGPUs can also be used with classic PEG slots, the new rackmount servers are a perfect COTS platform for any edge server requirement.



The smart carrier blades from Christmann can detect whether a COM Express Type 7 or Type 6 module from congatec has been plugged in. This makes it particularly easy to replace individual microserver modules.

In addition to the integrated 10/40 GB Ethernet switch, Christmann also offers an optional PCIe switch in the system that allows the individual microservers to seamlessly communicate with each other at extremely low latencies – a perfect foundation for fast, real-time data processing

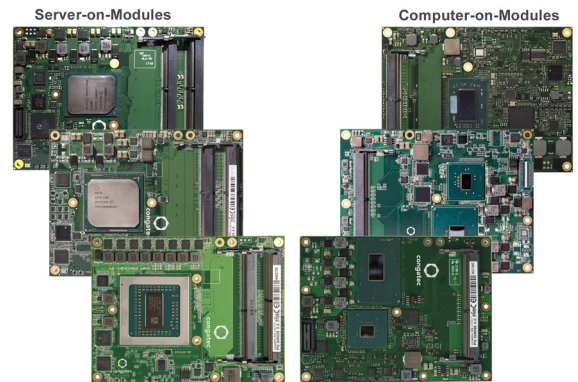
in applications that want multiple microservers to compute in parallel. With this new generation of industrial servers based on open, vendor-independent standards, Christmann is the first to create a technology basis.

As far as the Server-on-Modules are concerned, Christmann treats these as complete microservers in combination with the appropriate cooling and relies on modules from congatec. This is because congatec plays a key role in this area, is the European leader in the field of Computer-on-Modules in general, and provides excellent service.

“Sales of Computer-on-Modules and Server-on-Modules are always accompanied by personal integration support for OEM developers. There are no hotlines where you have to explain your problems all over again to a new employee every time

you call. One contact person takes care of all issues,” explains Micha vor dem Berge, Head of Server Development at christmann informationstechnik + medien.

In addition, congatec also offers comprehensive design-in services through its Technical Solution Center. The services offered by the Technical Solution Center range from customer-specific BSP customization to long-term hardware-related software maintenance for the OS. If required, the offer also includes the selection of suitable components for the carrier boards and blades, as well as design reviews and compliance tests of high-speed signals, thermal simulations, MTBF calculations and debugging services for customer-specific solutions. The goal is to always provide customers with the most convenient and efficient technical support – from requirement engineering to mass production.



The microservers can be equipped with Server-on-Modules or Computer-on-Modules from congatec as required.



Micha vor dem Berge is Head of Server Development at christmann informationstechnik + medien (see quote in main article)

About christmann informationstechnik + medien GmbH & Co. KG

christmann informationstechnik + medien GmbH & Co. KG is a manufacturer of energy- and resource-efficient IT systems founded in 2005. The company is engaged in the development of new solutions while also offering traditional system house services. Daily tasks include the design of tailor-made customer solutions, as well as the implementation of storage, data center, and infrastructure projects in cooperation with innovative partner companies, research institutions, and universities.

COM-HPC makes Christmann approach upwardly scalable

Current COM Express Type 6 or Type 7 Server-on-Modules have a limited memory support capacity, because the COM Express Basic form factor caters only for up to 96 gigabytes of RAM. This is sufficient for ultra-energy-efficient embedded server processors. However, upcoming processors will support much higher capacities of up to 1 terabyte. This requires larger footprints, which the COM Express standard has already specified. Another key bottleneck for more performance and interface support is the current COM Express connector, which provides 440 pins and PCIe Gen 3.0. The new COM-HPC specification, which is significantly better in terms of performance than COM Express, uses new high-speed connectors that support around twice as many interfaces and higher frequencies as required by the upcoming PCIe Gen 4.0 and beyond. In future, vendor-independent modules might also become available in the microserver performance range beyond 100 W TDP per processor. The new COM-HPC specification is expected to become available in 2019, with first series products likely to follow in early 2020. It is safe to assume that established server manufacturers will also gladly leverage this momentum, just as they are switching their business models to rental services. New business models are clearly moving towards subscription-based services, with software vendors like Zuora even predicting an end to the age of ownership. Whether these billing and revenue automationists will be right, only the future can show. However, the module approach is bound to offer Server-as-a-Service providers an immense margin of opportunity.

Prominent partners in the EU project

The University of Bielefeld, the German subsidiary of the Chinese Huawei Group, and the Polish supercomputer center PSNC were involved in the EU project M2DC (Modular Microserver DataCentre), along with other European companies and research institutions. An essential part of the project was the involvement of potential users: For example, CEWE, a supplier of photo books and internet-based photo editing, and Vodafone Automotive, which specializes in the automated processing of vehicle data, have been involved in the project right from the start. German IT company christmann informationstechnik + medien GmbH supplied the hardware basis with the innovative RECS Box 4.0 microserver and was also involved in the development of the central software components.

Author: Zeljko Loncaric | Marketing Engineer at congatec



About congatec AG

congatec is a leading supplier of industrial computer modules using the standard form factors COM Express, Qseven and SMARC as well as single board computers and customizing services. congatec's products can be used in a variety of industries and applications, such as industrial automation, medical, entertainment, transportation, telecommunication, test & measurement and point-of-sale. Core knowledge and technical know-how includes unique extended BIOS features as well as comprehensive driver and board support packages. Following the design-in phase, customers are given support via extensive product lifecycle management. The company's products are manufactured by specialist service providers in accordance with modern quality standards. Headquartered in Deggendorf, Germany, congatec currently has entities in USA, Taiwan, China, Japan and Australia as well as United Kingdom, France, and the Czech Republic. More information is available on our website at www.congatec.com or via [Facebook](#), [Twitter](#) and [YouTube](#).

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