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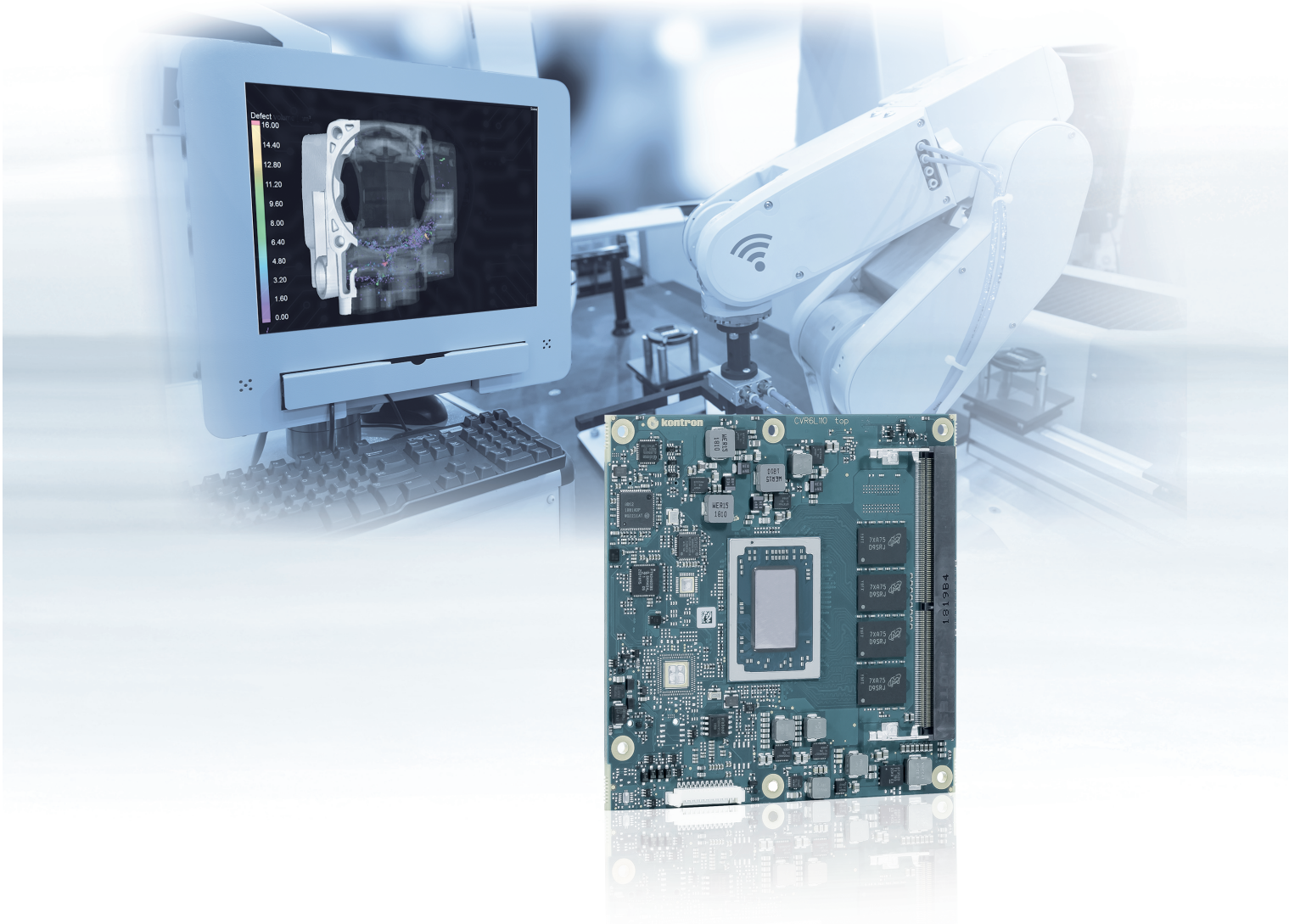

POWERFUL PROCESSOR ON A COMPACT MODULE

Kontron COM Express® Compact Modules with AMD Ryzen™ Embedded V1000 Processors

POSSIBILITIES START HERE

kontron
S&T Group

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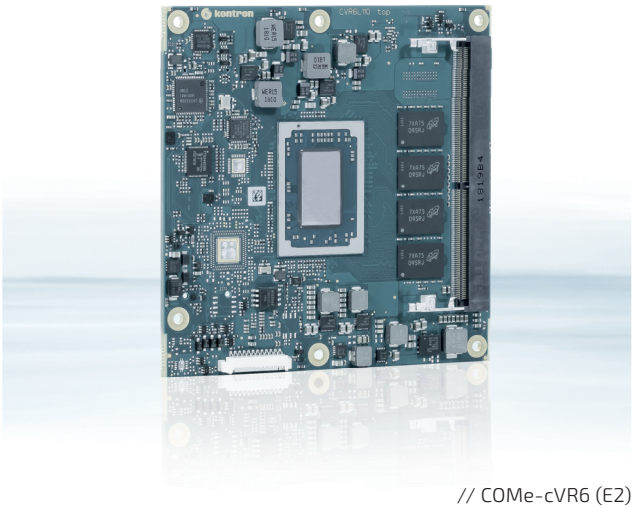
With the launch of the AMD Ryzen™ Embedded V1000, a new benchmark processor has hit the embedded market that is leading in all key categories of its class. Kontron offers the new processor also on COM Express® Compact, thus in a form factor that is much smaller and saves more space than most alternative offers.



// COMe-cVR6 (E2)

Significantly larger, on the other hand, is Kontron's OEM service package. Support encompasses the full customer requirement spectrum for cloud connection, from hardware development to cloud and ERP connection of systems. No other embedded computing provider offers such a complete range of OEM services from a single source.

With 'Zen', AMD has developed an extremely powerful microprocessor architecture that – paired with the new AMD Radeon Vega graphics with up to 11 compute units (CU) – delivers a very compelling complete package. For instance, the AMD Ryzen™ Embedded V1000 processors offer up to 2x more performance than the previous AMD Embedded R-Series (codename Merlin Falcon) and deliver up to 46 % more multi-thread performance than competitive solutions. In terms of graphics performance, the new Accelerated Processing Units (APUs) impress with up to 107 % more graphics performance than their predecessors and up to 3x more graphics performance than the competition. All in all, the new APUs with Zen CPU and Vega GPU achieve a performance throughput of up to 3.6 TFLOPS. This is a level of performance that until a few years ago was the exclusive reserve of processor and graphics card combinations with several hundred watts of power consumption.

MODEL	TDP	CORES/ THREADS	GPU CU [SIMD]	INDEPENDENT DISPLAYS	L2 CACHE	MAX. DDR4 CLOCK RATE	BASIS/TURBO FREQ.	DUAL ETHERNET PORTS
V1807B	35-54 W	4/8	11	4	2 MByte	3200	3.35/3.8	10 Gb
V1756B	35-54 W	4/8	8	4	2 MByte	3200	3.25/3.6	10 Gb
V1605B	12-25 W	4/8	8	4	2 MByte	2400	2.0/3.6	10 Gb
V1202B	12-25 W	2/8	3	4	1 MByte	2400	2.3/3.2	1 Gb

// AMD Ryzen™ Embedded V1000 variants at a glance

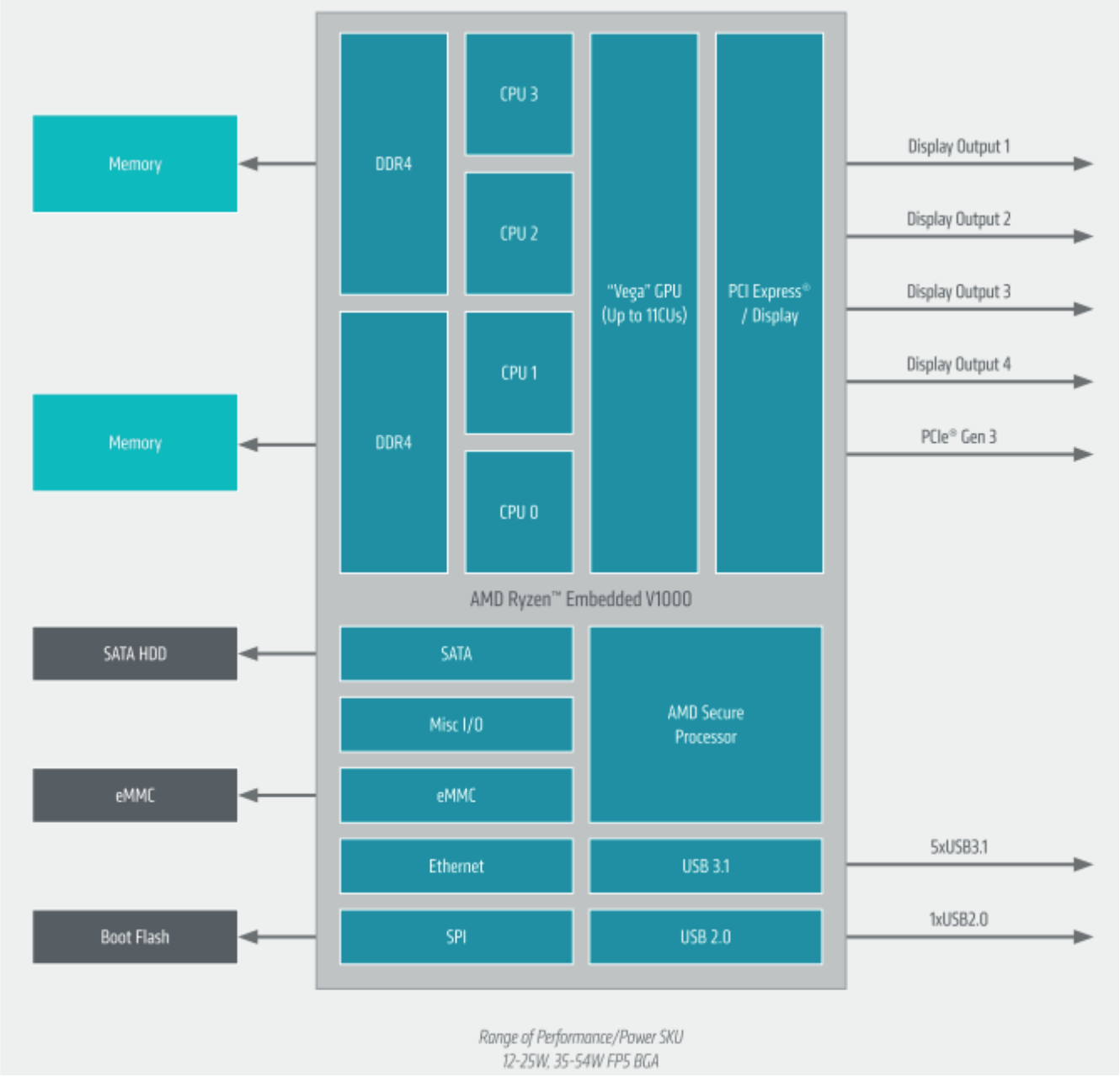
COMPREHENSIVE EMBEDDED FEATURE SET

Using OpenCL, developers can make the most of the GPU computing power for parallel computing tasks – for example, to accelerate medical and industrial image processing or machine learning tasks. Data-critical real-time applications also benefit from the optional ECC support for up to 32 GByte of fast and energy-efficient DDR4 RAM.

The new APUs also offer a comprehensive feature set for data and application security. The built-in AMD Secure Processor handles hardware-accelerated data encryption and decryption and can even secure the data in the main memory. For secure virtualization, Secure Encrypted Virtualization isolates the hypervisors and virtual machines without having to modify any of the code.

COMPREHENSIVE CHOICE OF INTERFACES

As far as I/Os are concerned, the new APUs execute all the latest state-of-the-art embedded interfaces: They integrate up to 4x USB 3.1 (10 Gb/s) ports, two of which even support full-fledged USB-C implementation. To do this, they offer DisplayPort Alternate Mode (DP Alt) for signals and Power Alt for power supply. For generic extensions, the APUs provide up to 16 PCIe Gen3 lanes – 8 of them for PCIe x8 graphics. In addition, AMD has also integrated two 10 GbE MACs. Further interfaces include 2x UART, 4x I2C, 2x SMBus, SPI/eSPI, I2S/HDA/SW and GPIO.



// Block diagram of new AMD Ryzen™ Embedded V1000 APUs

HIGH SCALABILITY

Next to performance and native interfaces, flexible scalability is required to be able to use the APUs in as many applications as possible. With their broad and configurable TDP range of 12 to 54 W cTPD, the new AMD Ryzen™ Embedded V1000 processors are suitable for almost all performance classes, from high-performance to low-power applications. With just one processor platform, developers can create complete product families, from stationary high-end embedded computing systems – depending on the thermal design even without active APU fans – to mobile low-power devices.

From a technical point of view, OEMs are perfectly positioned with the new AMD Ryzen™ Embedded family. Besides, the new processors generally also offer more attractive pricing compared to the competition, so that even cost-sensitive applications can benefit from the new processors.

TYPICAL HIGH-END APPLICATIONS

The powerful AMD Ryzen™ Embedded V1000 variants are particularly suitable for medical or industrial image processing systems, as well as complex automation systems with real-time virtualization for controlling entire manufacturing cells with multi-axis industrial robots. Collaborative robotics with situational awareness also benefits from the GPGPU functionality of the AMD Radeon Vega graphics, which is perfect for deep learning algorithms and artificial intelligence. But such parallel processing with the GPU is just as useful for high-performance test systems. Control room as well as advanced Industry 4.0 monitoring systems or CAD workstations and digital signage installations also benefit from the many supported displays and the 10-bit HDR performance.

LOW-POWER APPLICATIONS

With a TDP that is configurable down to 12 watts, the range of applications for the new APUs extends to fanless portable and handheld devices, such as portable management systems with real-time dashboards for Industry 4.0 factories, emergency medicine ultrasound systems or mobile test equipment. Even extremely rugged but highly efficient control and infotainment systems for use in trains, buses and other commercial vehicles can be realized. Autonomous vehicles handling intralogistics in smart factories are yet another application area that benefits from the high computing power at a low wattage.

HIGH SCALABILITY WITH COMPUTER-ON-MODULES

Kontron provides the new AMD Ryzen™ Embedded V1000 processors in a range of module and board form factors. So whatever the design challenge, Kontron can offer the best solution that OEMs can implement quickly, efficiently and cost-effectively. For many OEM designs, Computer-on-Modules are often the first choice; COM Express® if the modules need to be particularly powerful. Compared to board-level platforms such as Mini-ITX or 3.5" SBCs, Computer-on-Modules offer designers greater design freedom through the application-specific carrier board that allows interface customization in terms of number, layout and positioning. At the same time, the off-the-shelf Computer-on-Modules ensure high design security. Compared to a full-custom design, developers can also save considerable NRE costs, since the complex components such as processor, memory and high-speed I/Os are pre-integrated. In addition, modular designs are highly scalable by nature as the standardized modules can simply be swapped. This makes it possible to upgrade existing systems even years later, and even beyond processor generations. This prolongs the availability of own designs and the return on investment.

But which COM Express® form factor is suitable for the AMD Ryzen™ Embedded V1000 processors? The COM Express standard is particularly flexible: It currently supports three pinouts as well as three footprints – Basic (125 x 95 mm), Compact (95 x 95 mm) and Mini (84 x 55 mm).

PINOUT TYPE	PCIe LANES	SATA PORTS	LAN 1 G/10 G	USB 2.0/3.1	DISPLAY
6	24	2	1/-	8/4	Max. 4x with VGA, LVDS, PEG, 3x DDI
10	4	4	1/-	8/2	Max. 2x with LVDS/eDP, DDI
7	32	2	1/4	4/4	-

// Pinout Type 6 is ideal for AMD Ryzen™ V1000 processors

SMALLER IS BETTER

When comparing the possible pinouts, it quickly becomes clear that the Type 6 pinout is the ideal partner for the AMD Ryzen™ V1000 processor, as it defines the largest variety of interfaces and number of common PC extensions. There is general agreement among all embedded manufacturers on this point. Unlike many competitive solutions, Kontron doesn't rely on COM Express® Basic, but on COM Express® Compact – and for good reason: With a footprint that is around 22 % smaller, this small form factor is full on trend, as smaller modules can be used to develop more compact designs. But the smaller module also offers greater comfort and design freedom for larger systems. For instance, it enables developers to create flatter designs within a given system footprint. It is easy to explain why: The 22 % space savings on the carrier board mean that the external I/Os can be placed next to the Compact module instead of having to attach them on the underside of the carrier board. Compared to COM Express® Basic designs, this can reduce the height by up to 2 cm. Since the specifications of Basic and Compact are identical except for the dimensions – even the mounting holes for vibration-proof fixing of the modules on the carrier board are congruent – Compact modules can be used seamlessly in Basic designs. All in all, COM Express® Compact is therefore the smarter choice for the new AMD processors.

RUGGED BY DESIGN

The smaller form factor is only one of many other small but crucial differences that Kontron implements when designing its modules. For instance, the new COM Express Compact module with AMD Ryzen™ processor offers not only the standard DIMM bar, but also the option to additionally or alternatively use soldered memory. As a result, the module supports a total of up to 24 GByte RAM or provides more thermal and mechanical resistance with up to 8 GByte memory down. Thanks to the fixed connection, soldered memory modules are better to cool and stay in reliable contact even when exposed to extreme vibrations or shocks. So customers have a free choice of more storage or greater ruggedness.

In addition, all other components such as voltage dividers, capacitors and controllers are selected for highest reliability, resistance to environmental stresses and long-term availability. So Kontron's new COM Express® module is designed from the outset for use in harsh industrial environments. Of course, the new Kontron module also provides long-term support of at least 10 years combined with comprehensive obsolescence management, which has already proven its value in many applications in the medical, railway, aerospace and defense sectors.

COMPREHENSIVE DESIGN SERVICES

To enable customers to bring solutions based on the new modules to market faster, Kontron also offers comprehensive engineering support. The company not only supports its customers in the development of individual carrier board or full-custom board designs, but if required will also take care of complete system developments including all system mechanics demands. This is a much more comprehensive service than many other module manufacturers can offer. What is more, Kontron provides these services globally in all customer regions of the world. As a result of this global presence, customer coordination is always local, which significantly simplifies and accelerates processes.

However, Kontron's support goes far beyond excellent hardware and design services. Increasingly, comprehensive software services are an integral part of the embedded computing supplier's offering. They start with the uniform KEAPI Application Programming Interfaces, go on to include support for SGET's Universal IoT Connector (UIC) standard and also integrates the connection of ERP systems.

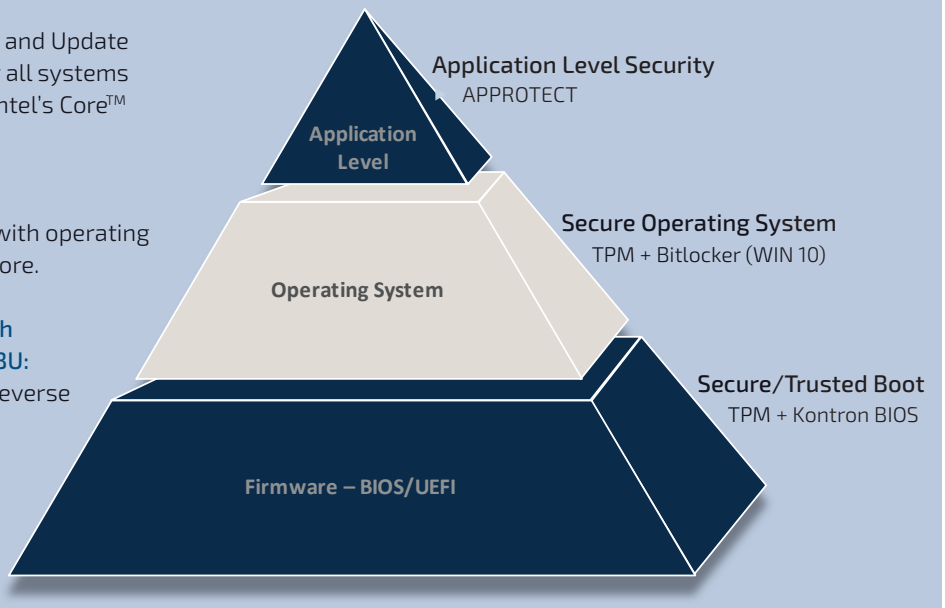
SOFTWARE PROTECTION AND MONETIZATION FUNCTIONS INCLUDED

The new COM Express® modules with the Kontron security solution APPROTECT also offer integrated software protection and monetization functions. Both the new Computer-on-Module and all upcoming Kontron boards based on the AMD Ryzen™ Embedded V1000 processor integrate an optional security chip from Wibu-Systems and a software framework specially developed for this chip. In conjunction, the two components prevent reverse engineering and copy attempts of own IP as well as third party software and also help with license management. Kontron APPROTECT licensing makes it possible to provide individual application functions for a limited time only – for instance for demonstration purposes – or for a restricted number of executions. This solution opens up completely new business models for Kontron's customers, such as feature-based licensing or pay-per-use services.

SECURITY SOLUTION KONTRON

3 levels of security ensure highest level of security for embedded systems

- **System Boot-Time Security:**
  Offering Secure/Trusted-Boot and Update implementations available for all systems with the latest generation of Intel's Core™ and Atom® CPUs.
- **Secure Operatin Systems:**
  Offering attractive bundlings with operating systems like Windows 10 IoT core.
- **Application Level Security with APPROTTECT powered by WIBU:**
  Offering copy protection and reverse engineering protection with hardware based encryption; on top enabling new business models by restricting runtime or features of any custom application.for all the above services.



OFF INTO THE CLOUD

Since this monetization, license management and IP protection feature requires a cloud or server service anyway, the path for additional cloud capabilities for custom-specific new services is already prepared. Naturally, Kontron also supports its customers with any other IoT applications that require cloud connectivity. For example, Kontron provides an implementation for SGETs UIC standard with regards to all module functions that can be addressed via Kontron's KEAP. This greatly simplifies the connection of hardware and peripherals to the cloud.

ALL THE WAY TO ERP INTEGRATION

Thanks to its merger with S&T, Kontron was able to leverage the cloud and SAP expertise of the group's Global Software Center when developing its complete 'no worries' service package for the new Computer-on-Module. It covers everything customers need for their new business models and the required business process automation. The range of services includes SAP integration, since S&T is an SAP S/4HANA cloud partner. The device-centric cloud offering also includes the implementation of Azure Machine Learning and Microsoft Cognitive Services Analytics applications. Because Kontron is a Microsoft Azure Partner and Cloud Solution Provider, services from the Microsoft cloud environment can also be obtained directly through Kontron. It goes without saying that the new module is also sold as a "Microsoft Azure Certified for IoT" device.

CONCLUSION

It's the little things that make the difference. As far as module size is concerned, less is often more. But when it comes to service, what counts is a flexible choice from a complete offer, because what good is great performance in one area if you need to improvise in another or buy from a third provider? A one-stop service is more efficient, faster and cheaper. Leading OEMs are therefore well advised to work with companies that offer the full range of services from a single source. By merging with S&T, Kontron has probably made the biggest leap any embedded computing manufacturer has ever made. It will be difficult for alternative providers to follow suit.

SERVICES CHECK LIST

What OEMs should look for in an ODM

- Large customer base so that specific processor assemblies are not just manufactured for OEM's own needs. Wide product portfolio so that the supplier doesn't have to incur NRE costs for only one form factor.
- Engages with embedded standardization bodies and provides comprehensive documentation support to make obtaining certification easier. No centrally managed development departments in APAC, but globally available design-in support for OEMs in local language and time zone wherever possible.
- Customized hardware designs from standard board customization to full-custom board-level and system-level designs.
- Comprehensive software services ranging from hardware monitoring systems through to cloud and ERP connection of innovative IIoT and Industry 4.0 solutions.
- Extensive OEM support during the development and introduction of new business models.
- Lifecycle management and long-term support for all the above services.

I Testing done at AMD Embedded Software Engineering Lab. The AMD R-Series Embedded SOC formerly codenamed "Merlin Falcon" scored 2399 and the AMD V-Series V1807 scored 4978, when running 3dMark® 11P benchmark which measures GPU performance. (4978/2399=2.075) The AMD R-series Embedded SOC formerly called "Merlin Falcon" scored 273 and the AMD V-series V1807 scored 665 on Cinebench R15 nT which measures multi-threaded CPU performance. (665/273= 2.435). AMD Embedded R-Series RX-421BD used a AMD "Bettong" Platform, with a 2x8GB DDR4-2400 RAM, 250GB SSD Drive (non-rotating), TDP 35W, STAPM and ECC Disabled, Graphics Driver 17.40.2011-171026a-320350C-AES, BIOS RBE1306A. AMD Ryzen™ Embedded V-Series V1807B used the AMD "Dibbler" Platform with 2x8GB DDR4 3200 RAM, 250GB SSD Drive (non-rotating), TDP 35W, STAPM and ECC Disabled, Graphics Driver 17.40-171114a-320676E-AES-2-wRV-E9171, BIOS TDB1100EA. Both systems ran Microsoft Windows® 10 Pro. EMB-144.

II Testing done at AMD Embedded Software Engineering Lab on the Intel Core i3 -7100U. The Ryzen 3 2200U was used to approximate the V1202B. The i3-7100U scored 254 and the AMD Ryzen™ 3 2200U scored 372 on Cinebench R15 nT benchmark which measures multi-threaded CPU performance. System Configurations: Intel Core i3-7100u: HP 15inch Notebook, i3-7100u with Intel® HD Graphics 620, 1x8GB DDR4-2133 RAM, 1 TB 5400 rpm SATA, Microsoft Windows 10 Pro, Graphics Driver 21.20.16.4627, BIOS F.07. AMD Ryzen™ 3 2200U: AMD "Mandolin" Platform, TDP 15W, STAPM enabled, ECC Disabled 2x4GB DDR4 2400 RAM, 512GB SSD Drive (non-rotating), Microsoft Windows 10 Pro RS3, Graphics Driver 23.20.768.0. EMB-147.

III Comparison is based on performance measured using the 3dMark® 11P benchmark. The AMD V-series V1807B scored 5618; the Intel Core i7-7700HQ scored 1783. The score for the Intel Core i7-7700HQ was measured using HP Omen with 8GB, Intel® HD 630 Graphics, 1x8GB DDR4 2400 RAM, 1TB 7200rpm HD, Microsoft Windows 10 Pro, Graphics Driver 21.20.16.4627, BIOS F.24. The score for AMD Ryzen™ Embedded V-Series V1807B was measured using the AMD "Dibbler" Platform, 2x8GB DDR4 3200 RAM, 250GB SSD Drive (non-rotating), TDP 45W, STAPM Enabled, ECC Disabled, Microsoft Windows 10 Pro, Graphics Driver 17.40-171114a-320676E-AES-2-wRV-E9171, BIOS TDB1100EA. EMB-146.

IV The equation makes assumptions for clock and uses 16-bit floating point operands. FLOPS = 11 CU * 4 SIMD/CU * 4Shaders/SIMD * 4 MAC/Pixel * 4 FLOPS/Cycle/ALU * 1300MHz = 3.661 TFLOPS. EMB-151.

About Kontron | Member of the S&T Group

Kontron is a global leader in IoT/embedded computing technology (ECT). As a part of technology group S&T, Kontron offers a combined portfolio of secure hardware, middleware and services for Internet of Things (IoT) and Industry 4.0 applications. With its standard products and tailor-made solutions based on highly reliable state-of-the-art embedded technologies, Kontron provides secure and innovative applications for a variety of industries. As a result, customers benefit from accelerated time-to-market, reduced total cost of ownership, product longevity and the best fully integrated applications overall.

GLOBAL HEADQUARTERS

KONTRON S&T AG

Lise-Meitner-Str. 3-5
86156 Augsburg, Germany
Tel.: + 49 821 4086-0
Fax: + 49 821 4086-111
info@kontron.com

www.kontron.com