eHPC MODULES WITH OUTSTANDING COMPUTING POWER

DESIGNED FOR INDUSTRIAL APPLICATIONS FROM EDGE TO CLOUD

POSSIBILITIES START HERE **kontron**

Edge, fog and cloud applications demand strongly increasing computing power. Traditional server approaches cannot provide the required robustness for operation in harsh industrial environments. Modular systems based on the well-established and tested COM Express modules provide an efficient solution. Type 7 is a new variant, which first time ever satisfies the demands for embedded high performance computing (eHPC).

In contrast to most business and IT applications, many production tasks cannot be easily outsourced to a cloud, although it would be useful by means of simplification, cost savings, and maintenance. In spite of modern infrastructures such as TSN-based networks, the physical length of the lines with the associated latencies often sets an abrupt end to the desire for real-time control out of the cloud. Also, many companies do not want to see their entire production data and know-how to be stored and processed outside the companies' premises. The proven solution to this challenge are approaches like edge and fog computing. In practice, this means to move the cloud physically closer to production and / or consolidate data by on-site pre-processing. Of course, there are robust, industry-grade edge gateways available however their performance is limited. In many scenarios, it is most cost-efficient and service-friendly to maintain ample computing power directly on site. A key enabler for cost-efficiency can be wide scalability-highest availability and reliability are generally required in industrial applications any way. Features, which have been long known and appreciated with standardized computer modules (COMs). So what would be closer than to build up an own, scalable computing infrastructure based on proven module systems? This way it could be designed to fit today's demands right now with the option to be upgraded later.

WHICH MODULE FROM WHICH MANUFACTURER?

One of the main advantages of the use of COMs is the largely pre-integrated platform. The customer can fully concentrate on the development of his own (application) software. This is where the know-how for the respective solution and also the actual core competency and the added value of his company is based. Ideally, the module supplier offers a carrier board, which already contains all required interfaces. If, however, special functions (in the industrial field, these are usually special fieldbus interfaces) are missing, it saves a lot of time and headaches if the corresponding know-how of the module supplier can be accessed. So the system integrator can

access existing solutions (IP) and / or resources of the module manufacturer easily. Additional resources can be saved and the development time can be further shortened. This applies in particular to elements which require specific knowledge and experience, such as all aspects of safety (safety and security). It is particularly important here that the module manufacturer uses components and technologies that have already proved their worth. Ideal are standardized, cross-platform concepts that also lead to time and cost-saving synergy effects with regard to know-how and quality.

eHPC (EMBEDDED HIGH PERFORMANCE COMPUTING) IN EMBEDDED CLOUD
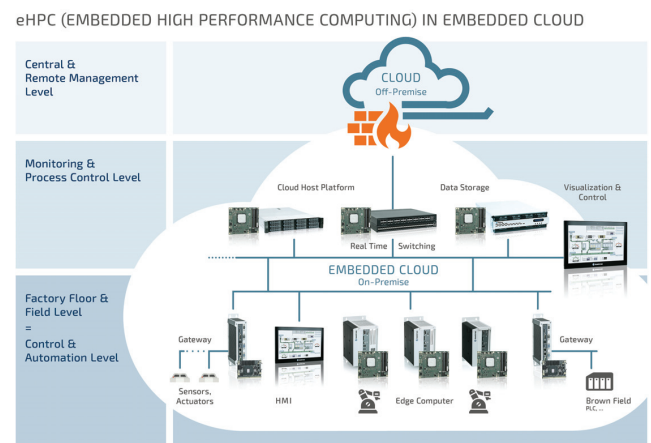
// Figure 1: Embedded Cloud Computing

A perfect manufacturer should be able to proof not only many years of experience in the production of standardized modules, but also reference a broad range of customers and experience based on the specific application. The widest scalability with regard to maximum power dissipation (and thus indirectly also maximum computing power) is currently under the established embedded module standards comes with the PICMG's COM Express standard. For instance, its "Basic" size form factor with the compact dimensions of only 95 x 125 mm² can use processors with a TDP (thermal design power) of 50 watts and more without problems. The rapidly growing demand for high computation and network performance in the modular and embedded

market has also led to the PICMG having redefined an ideal standard for exactly this task when it came to the last revision of the COM Express standard. This was derived from the COM Express Standard Type 6, which is dominating the current embedded market. With the partial reorganization of the signals on the connectors, graphic signals were dropped and replaced by four 10GBit interfaces to support requirements for more and faster external Ethernet connections. In addition, eight additional PCI Express® lanes were added to achieve higher throughput. A further advantage of the design concept of COM Express is that the modules can be used not only as mezzanines (plug-in boards) for a more or less complex carrier board, but also as a complete single-board computer (SBC). This makes building multi-module systems particularly easy. Depending on the thermal design, up to nine Type 7 modules in the "Basic" size and thus up to 144 CPU cores can be accommodated in a single 19" plug-in unit.

A PERFECT FIT: KONTRON'S COM Express TYPE 7 MODULES

Pioneering the evolution of standard COMs and as a long-standing member of the PICMG, Kontron has performed an important role with the creation of the new Type 7 standard. They are not just offering COMs and standardized carrier boards but also customer-specific carrier board development.

The long-term know-how as a market leader in embedded systems of various standards enables superior product quality with Hard- and Software and a great value pricing taking benefit of the associated synergy effects. Key features such as the APPROTECT security framework or the seamlessly integrated and IPMI-compliant, optional BMC (Baseboard Management Controller) are available for many Kontron platforms, while simplifying operation and maintenance for the customers.

This allows a wide scaling and application transparency even beyond the module and embedded area. Upgrades can be made by simple module exchange, and complex fieldbus and sensor interfaces as well as special machine adaptions on the baseboard can be maintained over several CPU generations.
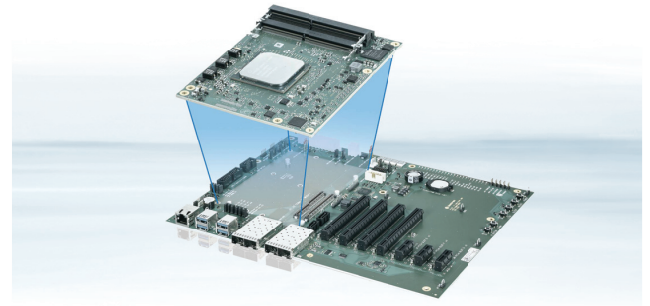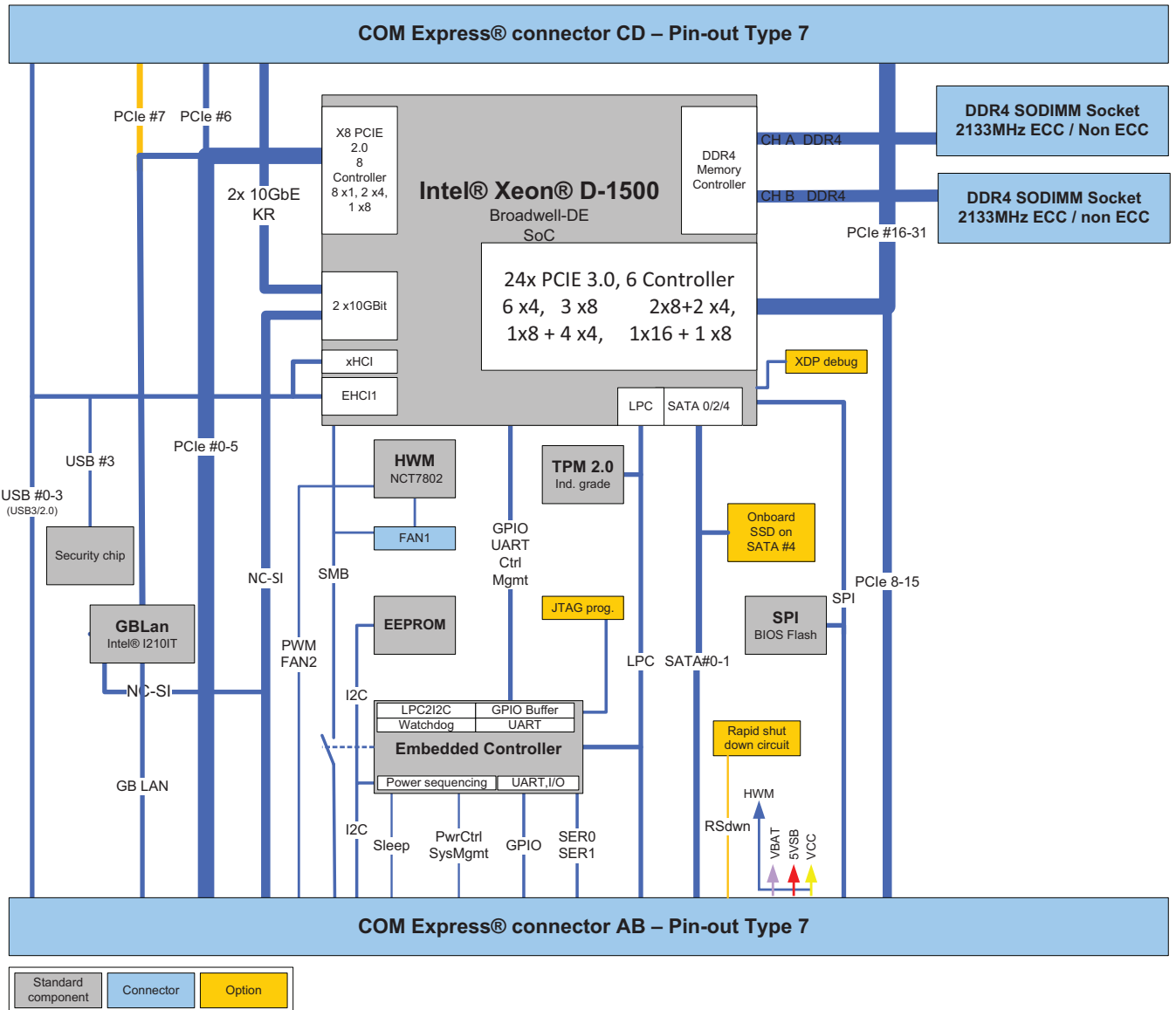

// Figure 2: Typ 7 Module with Carrier Board

While the COM Express standard is designed for operation in harsh industrial operation by default, Kontron's long-term experience with particularly hard-wearing ("rugged") computer hardware puts a significant benefit on top. The high level of vertical integration including inhouse production facilities within the S&T group supports the longevity and durability of the Kontron embedded products, too.

An additional advantage for all types of cloud and cloud-oriented applications is the scalability to the new Kontron embedded servers and the long-standing cloud and IT experience of the parent company S & T. No competitor can currently offer such widely scalable and comprehensive solutions.

The Kontron COME-bBD7 eHPC modules can be equipped with many popular CPUs of the current Intel® Xeon® Processor D-1500 family with 2 to 16 CPU cores, 25 to 45 watts TDP and up to 2.2 GHz clock frequency as well as variants for the extended temperature range of -40 °C to 85 °C. The two DDR4 SODIMM slots are dual-channel and ECC-capable and can be equipped with up to 32 GByte. In addition to the usual embedded features such as SPI, LPC, SMB, Fast I²C, RTC and staged watchdog, 2 serial interfaces, 4x USB 3.0 / 2.0 and 2 SATA3 interfaces with 6 Gb/s are standard on the module. Both the two on-chip 10GbE connectors as well as the Intel I210IT 10/100/1000 Mbit Ethernet controller can be connected to an external BMC present on the baseboard via NC-SI (Network Connect Sideband Interface). This BMC allows monitoring of the COMe-bBD7 module and supports remote management as well as preemptive maintenance measures. The COMe Evaluation Carrier T7 Board has been newly developed especially for the Kontron COMe-bBD7. It comes with an ATX form factor (305 x 244 mm²) and forms a turnkey server development platform together with the module. It supports e.g. 4x 10GbE, 32 PCIe lanes, 4x USB3.0, 2x SATA3, 2x RS232, GPIO, optional IPMI 2.0 compatible BMC (board management controller) with KVM support via adapter card. Kontron provides the full design documentation of the evaluation carrier for fast baseboard development.

COM Express® connector CD – Pin-out Type 7

DDR4 SODIMM Socket 2133MHz ECC / Non ECC

DDR4 SODIMM Socket 2133MHz ECC / non ECC

PCIe #7   PCIe #6

X8 PCIE 2.0 8 Controller 8 x1, 2 x4, 1 x8

DDR4 Memory Controller

Intel® Xeon® D-1500
Broadwell-DE
SoC

CH A   DDR4

CH B   DDR4

2x 10GbE KR

PCIe #16-31

2 x10GBit

24x PCIE 3.0, 6 Controller
6 x4,   3 x8   2x8+2 x4,
1x8 + 4 x4,   1x16 + 1 x8

XDP debug

xHCI

EHCI1

LPC   SATA 0/2/4

PCIe #0-5

USB #3

HWM
NCT7802

TPM 2.0
Ind. grade

Onboard SSD on SATA #4

USB #0-3
(USB3/2.0)

FAN1

GPIO
UART
Ctrl
Mgmt

PCIe 8-15

Security chip

SPI

SPI
BIOS Flash

NC-SI   SMB

EEPROM

JTAG prog.

GBLan
Intel® I210IT

PWM
FAN2

LPC   SATA#0-1

NC-SI

I2C

LPC2I2C   GPIO Buffer

Watchdog   UART

Embedded Controller

Power sequencing   UART,I/O

Rapid shut down circuit

GB LAN

HWM

I2C   Sleep   PwrCtrl SysMgmt   GPIO   SER0 SER1   RSdwn   VBAT 5VSB VCC

Standard component	Connector	Option

// Figure 3: block diagram Kontron COMe-bBD7

In addition, Kontron offers optional design-in support by experienced engineers. This enables a significant further shortening of development times. If necessary, the eHPC module itself can be modified, too, in order to optimal adaption to specific customer requirements. As a long-term market and technology leader, Kontron has both the know-how and the capacities for its design services.

SECURITY MATTERS!

Each COMe-bBD7 module by default features Kontron APPROTECT, a comprehensive, cross-platform security which consists of hardware and software components and can be activated after purchase in order to protect your own software investment. It contains modules for copy protection, IP protection (licensing), protection

against reverse engineering and tampering. This allows comprehensive license management and completely new licensing and business models, such as billing according to usage time and test periods for certain features. It also can be retrofitted for legacy systems. The integrated Trusted Platform Module (TPM) 2.0 chip ensures the highest security level.

APPROTECT today has the broadest scalability of all integrated security solutions in the market. The support ranges from poorly resourced nano systems with single core up to big multicore server modules - everything is available from a single source! Kontron's turnkey solution enables highest security for customer data and programs with least implementation effort.

HOW ABOUT THE FUTURE?

Big Data is the trend of the future and more and more data must be reliably recorded and processed physically close to machine and cloud. Interfaces to sensors and actuators are largely stable technology and only the requirements for computing power grow disproportionately. So embedded solutions with interchangeable computer modules (COMs) offer an unbeatable price/performance ratio and guaranteed future. The robust design allows safe use within an immediate production environment. The possibility of outsourcing control functionality to real-time embedded high-performance computers (eHPC) and their physical proximity to the production equipment lead to further cost savings through consolidation without sacrificing safety or functionality.

eHPC – enabling data analysis and real time processing on one platform
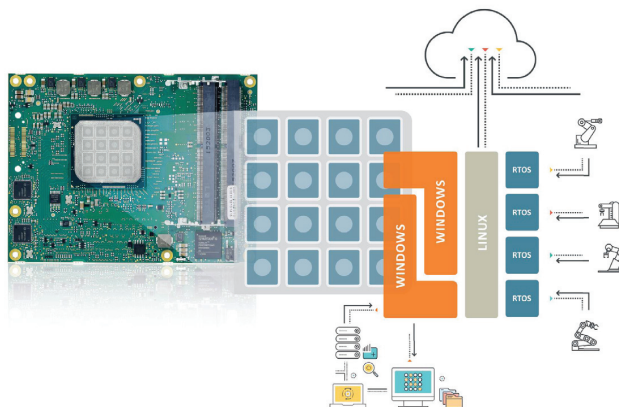
// Figure 4: Consolidatet real-time system with eHPC

TRUST THE MARKET LEADER:

Kontron is world market leader when it comes to integrated embedded server systems.

The market leadership is further expanded by new synergetic corporate structures and fresh money. The friendly merger with S&T strengthens Kontron's market position even more as the share of software in today's industrial solutions is becoming ever more important.

Kontron offers complete, scalable solutions from a single source, which results in a long term secure investment.

About Kontron – An S&T Company

Kontron is a global leader in 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.

Kontron is a listed company. Its shares are traded in the Prime Standard segment of the Frankfurt Stock Exchange and on other exchanges under the symbol "KBC". For more information, please visit: **www.kontron.com**

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