

English



German



ISBN 3-8259-1944-7

19,80 €

# Computer-On-Modules

With high scalability and Value-Add Service  
for your customized solution

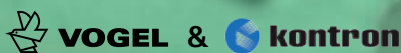


## Basics

- COMs for your high scalability
- ETXexpress® / COM Express up to Intel Multi-Core processor
- microETXexpress™ for your mobile applications
- ETX® 3.0 – Your ETX Long Term Support
- E<sup>2</sup>Brain – Technology and Applications
- Smart Battery Module MARS – Requirements for mobile applications
- Intel Multi-Core in Embedded Systems
- A look at the future of COMs

## Hands-On

- Company Profiles for your customised COM solution



A VOGEL and Kontron Special for professionals in collaboration with:

Intel, b-plus, datakamp System, FORTEC Elektronik, HY-LINE Computer Components, ies Industrie-Elektronik Schmitz, Ineltro, next System, Ultratronik, VDC, Venco Electronica S. A.

# Into the future with Computer-On-Modules

The standardized Computer-On-Modules DIMM-PC, X-board, E<sup>2</sup>Brain, ETX, microETXexpress and ETXexpress/COM Express, provide the standard functionality you

need, while the custom features demanded by your application are integrated into the baseboard design. This separation allows for a high degree of flexibility in the mechanics of the base-board since it is a custom made part, but offers you the flexibility to switch boards within the module family. Total design time for the baseboard is very short compared to a full custom design cycle. This keeps the costs down and ensures a short time-to-market. Products based on embedded modules are highly scalable and have longer lifecycles than the alternatives.

A VOGEL and Kontron publication



In collaboration with:	
b-plus GmbH	<a href="http://www.b-plus.com">www.b-plus.com</a>
datakamp Sytem GmbH	<a href="http://www.datakamp.de">www.datakamp.de</a>
FORTEC Elektronik AG	<a href="http://www.fortecag.de">www.fortecag.de</a>
HY-LINE Computer Components GmbH	<a href="http://www.hy-line.de">www.hy-line.de</a>
ies Industrie-Elektronik Schmitz GmbH & Co. KG	<a href="http://www.ies-gmbh.de">www.ies-gmbh.de</a>
Ineltro AG	<a href="http://www.ineltro.ch">www.ineltro.ch</a>
Intel GmbH	<a href="http://www.intel.com">www.intel.com</a>
next system Vertriebsges.m.b.H.	<a href="http://www.nextsystem.at">www.nextsystem.at</a>
Ultratronik GmbH	<a href="http://www.ultratronic.de">www.ultratronic.de</a>
VDC	<a href="http://www.vdc-corp.com">www.vdc-corp.com</a>
Venco Electronica S.A.	<a href="http://www.vencoel.com">www.vencoel.com</a>

**Fax +49 931 418 - 2543**

[Anja\\_Kemmer@praxis-profiline.de](mailto:Anja_Kemmer@praxis-profiline.de)

**Yes,** please send me the marked title for the price mentioned plus forwarding expenses  
(Germany 2,50 €; other countries 5 €)

PRAXIS PROFILINE  
Computer-On-Modules (COM)  
February, 2007 issue  
Approx. 100 pages  
German/English  
ISBN 3-8259-1944-7

Copy price  
€ 19,80

Sender

Name, first name  Company

Address

Telephone/Fax  E-mail



# COM Express

*– modular solutions for embedded processing*

■ The advent of the Computer-on-Module (COM) turned the old notion of add on modules on its head. Originally, daughter boards or add on modules were designed to add specific IO functionality to a general purpose processor base boards. OEMs would add their unique connectivity or input output requirements to an off the shelf processor board to develop a complete computer based control system. Over the years the computing functions have become more generalized, more integrated, smaller and less expensive to the point where it is now the application specific functions that take up more of the design time and board space in an embedded application.

Keeping track of chipset advances and synchronizing them with processor evolution is a major challenge that most embedded system OEMs don't want to deal with. The relentless advances in processor speed and density call for designs that are "future proofed" with a clearly defined growth path to the next round of improvements. The use of Computer-on-Modules based designs simplifies the life of the embedded system designer and leaves them free to concentrate on their specialty will providing them with an automatic upgrade path.

The latest generation of interconnects based on Low Voltage Differential Signaling (LVDS) technologies have made it possible to generalize the interfaces to a generic processing module. The advent of new LVDS based interconnects such as PCI Express as well the next generation of peripheral

interconnects like USB and Serial ATA created the opportunity to define a standardized processing module form factor and interconnect. This effort was undertaken within the PICMG process and resulted in the PICMG COM.0, or COM Express specification that was approved by PICMG on 10th July 2005.

The specification incorporates all the latest interfaces necessary to support a complete Computer-on-Module while providing flexibility to support a wide range of performance and functional requirements. Two module sizes are defined so customers can choose from the basic form factor or an extended form factor that supports more memory, larger processors and a higher thermal envelope. Two rows of connectors are part of the specification with the second being optional if more interfaces and capacity is required.

COM Express modules are already making inroads in the embedded computing market where OEM designed systems are common. These markets include medical, test and measurement, gaming, industrial automation, security, point of sale, advertising, military and others.

The COM Express specification has effectively aligned the latest needs of embedded systems developers with the latest advances in computer and interface technologies and provides the leading modular solution for embedded processing. ■



*Rob Davidson,*  
Vice President Marketing,  
PICMG  
[www.picmg.org](http://www.picmg.org)



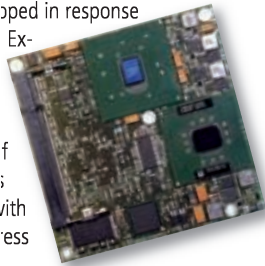
# Computer-On-

With high scalability and Value-Add Service for your

**SMALL FOOTPRINT, GREAT POTENTIAL**

microETXexpress was developed in response to the huge demand for PCI Express-based COMs in the segment for microapplications such as mobile applications. It takes the shape of more compact COM Express module and is compatible with other ETXexpress/COM Express products.

page 16



**THE CASE FOR READY-MADE PROCESSOR MODULES**

Selecting an appropriate processor module can save large amounts of development and test effort and allow a company to concentrate on using its expertise in a target market to add unique value.

page 22



**EDITORIAL** 3

**BASICS**

Intel Multi-Core Processors for COMs A rich array of options for applications requiring increased performance	6
Computer-On-Modules A global market analysis	8
A comparison of embedded COMs Processing power and expansion buses determine COM form factors	10
Small Footprint, Great Potential microETXexpress heralds the second COM Express standardization round	16
ETX 3.0 Sound Investment for Hundreds of Thousands of ETX Designs	18
Multi Core COMs One processor, two cores, a wealth of options for COM	19
A Standard for Embedded-RISC-Systeme Define the choices	20
The Case for Ready Made-Processor Modules High-end Digital Camera with RISC-COMs	22
COM Management made easy EVA: A single board handling standard for all COMs	24
Easy Graphic Adaption The right flat panel controller is usually available as an accessory	26
Service for COMs Customer-specific solutions increasingly important	27
Power supply via "copy and paste" MARS: Modular energy management development platform	28
The borrowed Eye Wearable PC with Kontron ETX COM used around the world in mobile service	30
Flash as Hard Drive Robust but only long-lived when the right technology is used	32

# Modules

## customised solution

<b>TALK TO EXPERTS</b>	
Teamwork with COMs More service for developers – Armin Schwarz talks with Kontron CTO Dirk Finstel	14
<b>APPLICATION NEWS</b>	
ETX-Modules - the third generation	34
<b>PRODUCT NEWS</b>	
Latest COMs	37
<b>COMPANY PORTRAITS</b>	
Datakamp Flexible and high quality	40
Fortec All the Know-how of a reliable partner	41
Hy-Line Solutions, service and support from one source	42
IES Speed & versatility	43
Ineltro Comprehensive range	44
Ultratronic Successful for more than 30 years	45
B-Plus Embedded solutions for industrial and automotive markets	46
Next System Head up in the sky - feet on the ground	47
Venco Electronica S.A. Complete solutions from customized to COTS systems	48
<b>COM PARTNER-LIST</b>	49
<b>IMPRINT, COPYRIGHTS AND TRADEMARKS</b>	12

### EMBEDDED SOLUTIONS FOR INDUSTRIAL AND AUTOMOTIVE MARKETS

B-plus develops, manufactures and sells electronic system components for industrial applications.

At the forefront are modern embedded computer systems, on the basis of ARM, Xscale and X86 architectures.  
[page 46](#)



### SOLUTION, SERVICE AND SUPPORT FROM ONE SOURCE

HY-LINE Computer Components GmbH is specialised in sales and support of embedded computing and display technology  
[page 42](#)



### SPEED & VERSATILITY

ies Industrie-Elektronik Schmitz GmbH & Co. KG develops, produces and markets electronic system components which are designed for industrial applications.  
[page 43](#)



### SUCCESSFUL FOR MORE THAN 30 YEARS

Products of Ultratronic are essential in automation and process controlling. The current product portfolio ranges from electronic components to servers, from industrial displays to so called Open Frame Smart Panels with included operating system.  
[page 45](#)



# Intel Multi-Core Processors for COMs

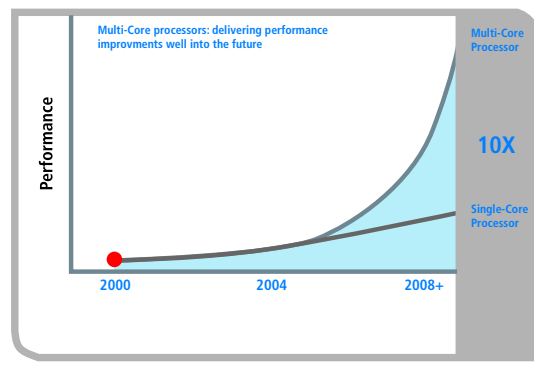
*A rich array of options for applications requiring increased performance*

*“The trend across the industry will be in the direction of multi-core processors to increase performance while maintaining or decreasing chip power consumption.”*

*Jim McGregor, Principle Analyst with In-Stat*

*Ajit D. Patel  
Marcos Garcia-Acosta*

**Forecasted Normalized Performance vs. Initial Intel® Pentium® 4 Processor**



Intel’s product line of multi-core processors for the communications and embedded applications market segments offers scalable processing capability while addressing the constraints of both COM footprints and power consumption.

While incorporating advanced processor technology, these multi-core processors remain software-compatible with previous 32-bit Intel Architecture processors. And, since applications use system resources differently, Intel offers a number of ways to enhance embedded application’s performance.

**Power-Efficient Performance Headroom**

With each execution core functioning as a separate processor, multi-core designs allow specific applications to be assigned to different cores, enhancing performance and security. For example, in embed-

ded application environments, it is possible to run real-time tasks on a dedicated execution core, unencumbered by tasks that would otherwise compete for CPU resources.

Using virtualization technology with multi-core processing, it is possible to run two non-SMP operating systems and unmodified software stacks for increased aggregate performance.

In a single compute intensive or data intensive application environment, multi-core technology can enhance performance by enabling the developer to decompose the application into parallel instruction and/or data streams.

Intel Software Development Products ease the transition from sequential to parallel processing by assisting the developer in identifying threading opportunities and in tuning threaded application performance.

**Intel Core Micro-architecture**

Intel Core microarchitecture provides enhanced energy-efficient performance to help equipment manufacturers optimally balance processing capabilities within power and space constraints. This allows for the use of Intel processors in embedded and communications applications where they had not been thought before. The key new features include:

- ▶ **Intel Wide Dynamic Execution:** Executes four instructions per clock cycle to improve execution speed and efficiency. Each core can complete up to four full instructions simultaneously using an efficient 14-stage pipeline.
- ▶ **Intel Advanced Smart Cache:** Improves system performance by significantly reducing memory latency to frequently used data through dynamic allocation of shared L2 cache to each of the processor cores.
- ▶ **Intel Smart Memory Access:** Optimizes use of available data bandwidth from the memory subsystem to accelerate out-of-order execution. A newly designed prediction mechanism reduces the time in-flight instructions have to wait for data. New pre-fetch algorithms move data from system memory into fast L2 cache in advance of execution. These functions keep the pipeline full, improving instruction throughput and performance.
- ▶ **Intel Advanced Digital Media Boost:** Accelerates execution of SSE/2/3 instructions to significantly improve



*Ajit D. Patel is Business Alliance Manager in the Intel Communications Alliance*

[www.intel.com](http://www.intel.com)



*Marcos Garcia-Acosta is Business Alliance Manager in the Intel Communications Alliance*

[www.intel.com](http://www.intel.com)

multimedia performance. 128-bit SSE instructions are issued at a throughput rate of one per-clock cycle, effectively doubling the speed of execution on a per-clock basis over previous-generation processors.

#### ► Intel Intelligent Power

**Capability:** Manages runtime power consumption of execution cores by turning on computing functions only when needed. Reduces overall power consumption, enabling quieter, more power-efficient system designs.

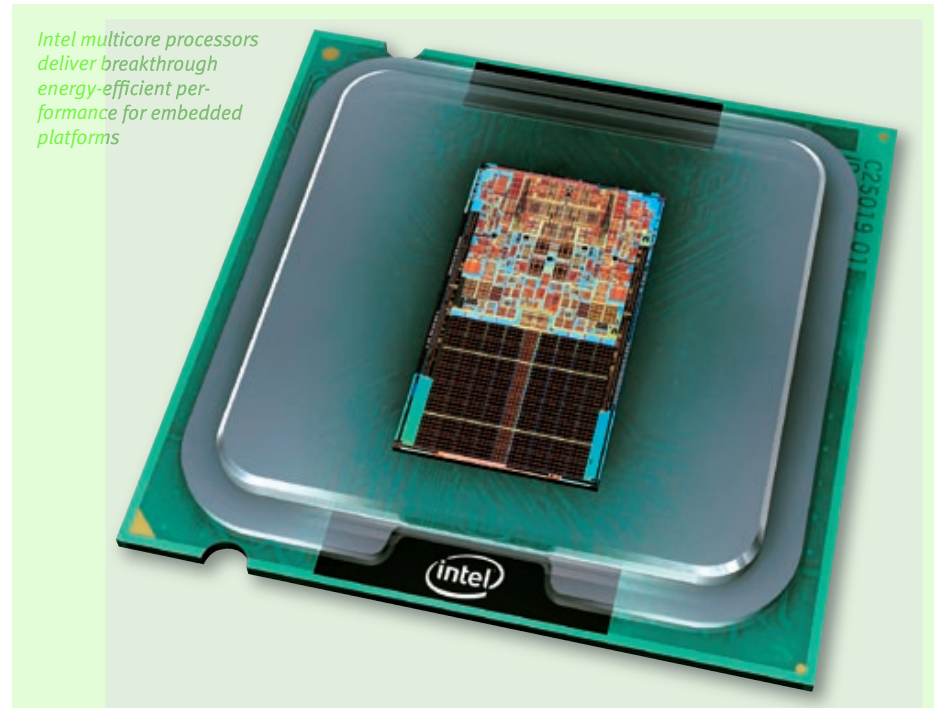
### Intel Core Duo Processors

Intel Core Duo processors meet the needs of a wide range of low-power embedded solutions, such as industrial control, test and instrumentation, aerospace, defense and medical imaging systems. Intel Core Duo processors integrate two execution cores derived from the Intel Pentium M processor, whose power efficiency is enabled through significant hardware architecture enhancements in stack management, instruction execution, and branch prediction. Integrating two execution cores enables Intel Core Duo processors to provide significant performance improvements while remaining in a thermal envelope that is similar to existing Intel Pentium M processors.

Intel Core Duo processors are validated with the Mobile Intel 945GM Express chipset. This chipset provides greater flexibility for developers of embedded applications by offering improved graphics and increased I/O bandwidth over previous Intel chipsets. And, it offers remote asset management capabilities and improved storage reliability.

### Intel Core2 Duo Processors

Intel Core2 Duo processors are members of Intel's growing product line of multi-core processors and are based on Intel Core microarchitecture, delivering breakthrough energy-efficient performance for embedded platforms. Intel 65nm process technology makes it possible to integrate two complete execution



cores in one physical package, providing advancements in simultaneous computing for multithreaded applications and multi-tasking environments. These processors meet the needs of a wide range of performance intensive, low-power embedded applications in smaller form factors such as interactive clients (i.e., point-of-sale terminals and ATMs), gaming platforms, industrial control and automation, digital security surveillance and medical imaging. While incorporating advanced processor technology, these processors remain software-compatible with previous IA-32 processors.

With Intel 64, software developers can address up to 1TB of physical memory, paving the way for greater performance by eliminating paging penalties associated with smaller memory spaces.

For applications requiring complex calculations and a high level of precision, developers may consider writing 64-bit code. Because the system can manipulate data and execute instructions in 64-bit chunks, these applications can yield vastly improved performance over their 32-bit counterparts. Intel's approach to extended memory

technology allows the processor to run either 32-bit or newly written 64-bit code. Intel platform-based network acceleration addresses the data movement, data access, and system overhead problems inherent in network I/O. By offloading CPU-intensive TCP/IP stacks, Intel I/O Acceleration Technology will move data to and from some applications much faster, allowing network and system managers to realize a greater performance return on their investments in increased network and storage capabilities.

The Intel Core microarchitecture clearly means more customer value and new business opportunities in the form of increased performance and new functionality.

### Conclusion

Intel has long been the leader in the design and manufacture of microprocessor technology. Through its advanced component design and manufacturing capabilities, Intel delivers reliable, high volume platforms optimized across multiple processor, chipset, memory, and controller components. Intel engineers are pushing the envelope in silicon design to improve energy efficiency and functionality.

The wide variety of features offered by Intel processors, chipsets and platforms has given birth to a vast community of innovative companies that have produced solutions in a wide range of communications and embedded market segments.

These companies offer unique hardware designs and innovative software products to address the needs of embedded and communications OEMs. Intel products, Intel people and an extensive ecosystem that includes members of the Intel Communications Alliance stand ready to help you put together all the building blocks needed to effectively serve the needs of your embedded customers.

Whether your end user is looking for raw performance, enhanced security, or remote management capability, by building upon Intel platform technology a trusted ecosystem such as the Intel Communications Alliance, you will be able to increase the value you bring to your customer.

#### MORE INFORMATION

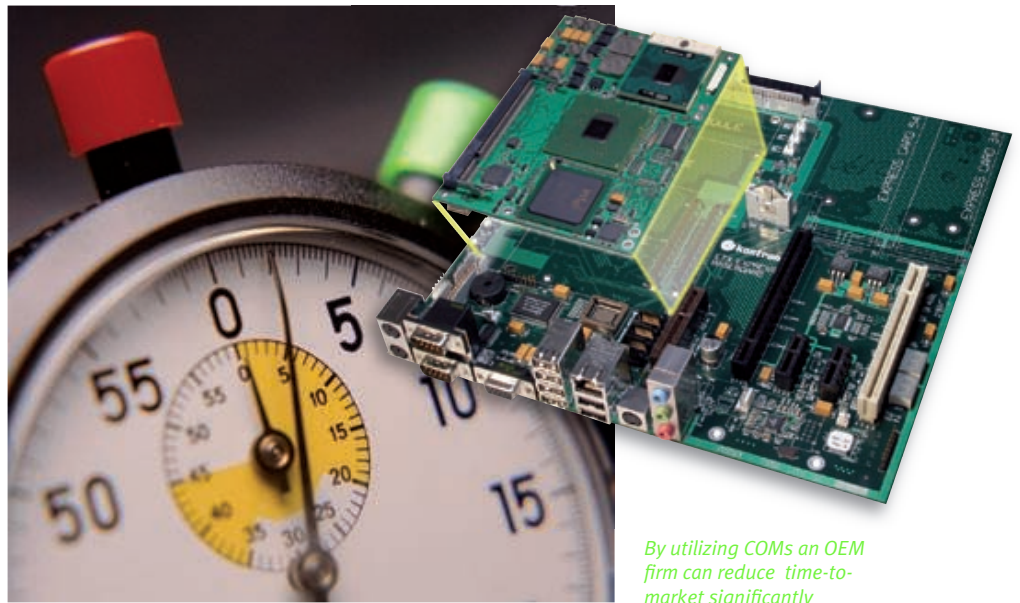
More on Intel multi-core processors for Communications and Embedded Applications:  
<http://www.intel.com/products/embedded/processors.htm>

# Computer on Modules

## A global market analysis

Computer-on-Modules (COMs), sometimes referred to as Systems-on-Modules (SOMs), are small, relatively highly integrated CPU boards intended to plug into, and be used with, carrier boards.

Eric Heikkila



By utilizing COMs an OEM firm can reduce time-to-market significantly

Unlike processor mezzanine cards, COMs are not intended to be optional additions to their carriers (although they may be used in this manner). Rather, COMs are intended to be integral parts or macro-components of systems or subsystems, wherein the carrier boards (which may be active backplane motherboards, passive backplane slot cards of various types, etc.) require computing power.

By utilizing COMs/SOMs (note that these terms may be considered synonymous), an OEM firm can:

- ▶ Reduce time-to-market significantly
- ▶ Concentrate on its areas of prime competency (the carrier boards), rather than devoting engineering talent and other resources to designing the compute portion of these boards; and
- ▶ May be able to provide a relatively painless path for compute-power upgrade, both in terms of

its own board offerings and for users. VDC has completed its 2006 Global Market Analysis of Computer-On-Modules that examines the market into great detail and deep segmentation. Form factors and architectures examined include, but are not limited to:

- ▶ DIMM-PC;
- ▶ ETX;
- ▶ STX;
- ▶ SOM-144;
- ▶ COM Express; and
- ▶ Proprietary.

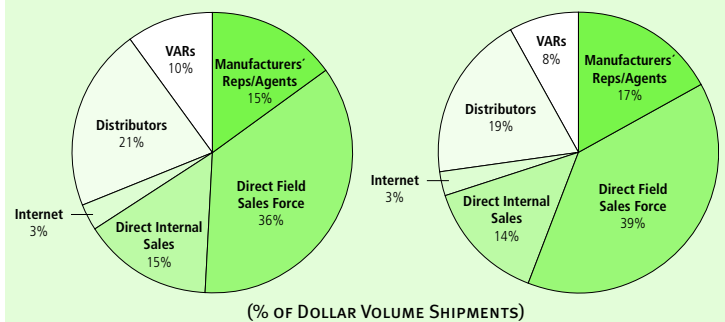
The concept of COMs originated in Europe, so it is logical that the



Eric Heikkila is Director Embedded Hardware & Systems with VDC

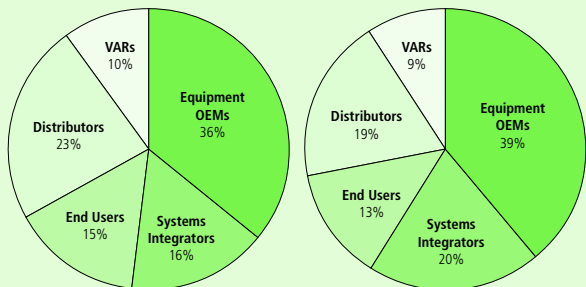
[www.vdc-corp.com](http://www.vdc-corp.com)

COM AND COM CARRIER SHIPMENTS BY CHANNEL OF DISTRIBUTION, 2005 & 2007

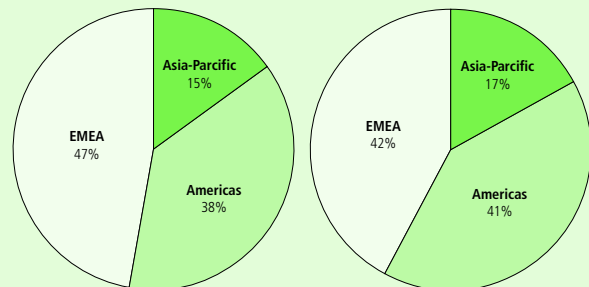




**COM AND COM CARRIER SHIPMENTS BY CONSUMING CUSTOMER CLASS, 2005 & 2007**



**COM AND COM CARRIER SHIPMENTS BY GEOGRAPHIC REGION, 2005 & 2007**



largest shipment share of these would be consumed in this geographic region. However, projections show increasing penetration into other geographic regions and the Americas are projected to nearly catch the European region by 2007. The concept surrounding the implementation of COMs continues to resonate with new audiences as a relatively painless way to provide path for future compute-power upgrade to products. As stated previously growth will be greatest in the Americas and Asia-Pacific as the European market has had longer exposure to the COMs concept.

**COMs become increasingly popular with OEMs**

COMs are beginning to see greater penetration with both OEMs and Systems Integrators as these classes of customers become more familiar and comfortable with the concept of using COMs in

computing products. The dollar volume shares of these two customer classes are projected to increase through 2007 at the expense of the shares consumed by distributors and VARs. Distributors and VARs are projected to lose share through 2007, however the overall growth of the COMs market more than makes up for these decreases and shipments to distributors and VARs are still projected to grow through 2007.

In-House manufacture remains the very predominant mode of manufacture and is even projected to have a greater share, over 90 per cent, by 2007. This reason for this is most likely attributable to the proprietary beginnings of the COM marketplace. At the beginning different manufacturers were producing their own different form factor COM products. Open standards such as ETX and COM Express have helped to change the proprietary nature of the COMs market, however, with variations possible even in

COMs meeting the standards many manufactures still seem to prefer to keep the manufacture of these products close to home where they can control it.

A very small percentage of COMs are manufactured in the United States. Again this is due to the fact that the COMs market got its roots from the EMEA region where companies such as Kontron, MEN Mikro, DIGITAL-LOGIC, Compulab, SECO, and MSC Vertriebs remain leaders. Other COMs innovators based in Asia-Pacific include Advantech, ADLink Technologies, ARBOR Technologies, and PFU Systems. The only major COM supplier so far based in the United States is Radisys.

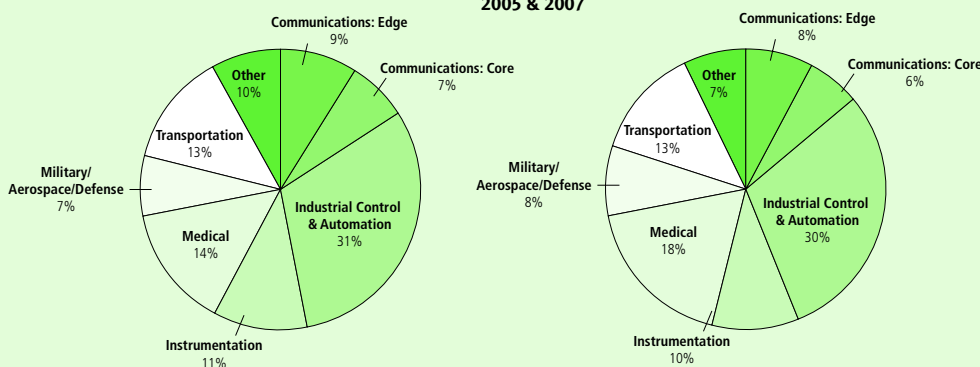
**Vertical markets remain strong**

Vertical markets such as industrial automation & control, medical, and instrumentation, which are very price sensitive when it comes to comput-

ing, remain the biggest consumers of COMs in 2005 and in 2007 projections. Medical is projected to be the biggest share gainer through 2007. COMs provide a very cost effective and somewhat painless path towards compute-power upgrades. COMs allow computing suppliers to these vertical markets to design products that take advantage of the most cost effective processors offered today that will still get the job done, while also providing the ability to easily upgrade the products in the future as more processing power is need. It is both easy and cost effective because it allows for replacement of only the processor and not carrier boards. Although there are projected changes in shipment shares to the various examined verticals, overall market growth will more than compensate for these shifts.

Since 1982, this regularly-scheduled market intelligence program examines established and emerging global markets for embedded slot Single Board Computers, CPU Blades, mezzanine cards, Computer-on-Modules (COMs), "stackable" architectures such as PC/104, and other related technologies. Reports emphasize granular, accurate market estimating and forecasting, as well as detailed segmentation across vertical and application markets.

**COM AND COM CARRIER SHIPMENTS BY VERTICAL MARKET, 2005 & 2007**



**LINKS**

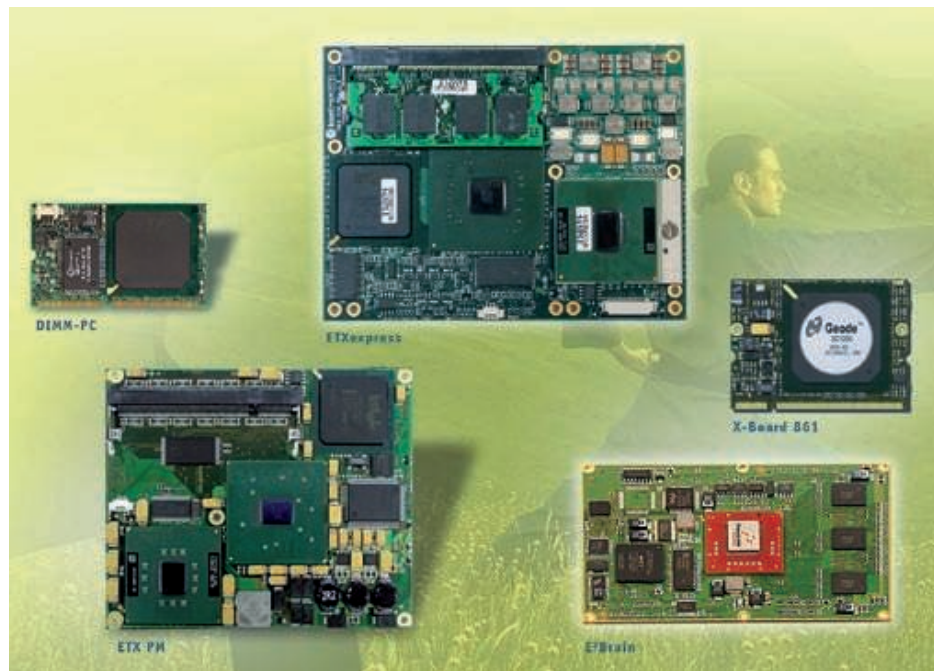
The latest reports are available at: <http://www.vdc-corp.com/ehw/mcbrea.asp>

# A comparison of embedded COMs

*Processing power and expansion buses determine COM form factors*

*The embedded computing Computer-on-Module (COM) market is still relatively young: the DIMM-PC, the first COM, was launched in 1998.*

Zeljko Loncaric



*The most popular Computer-on-modules*

Today, a variety of COMs are available as standard COTS hardware. They provide core PC functions in customer-specific embedded systems. In recent years, there have been intense discussions on the right concept for COMs; a 2002 VDC study and PICMG's publication of the COM Express standard with PCI Express on board in 2005, seem to indicate that development is concentrating on a few open standards that will give the greatest benefit to customers.

According to a report by market analyst VDC (Natick, Massachusetts, USA), in 2002, the Computer-On-Module market for customer-specific

embedded baseboard designs was worth US\$ 44 million [1]. In 2004, it reached US\$ 121 million, and in 2008 the market volume for COMs and COM base boards should be worth around US\$ 515 million, 11.1 per cent of the total embedded board market. In 2005, COMs have a mere 3.9 per cent of the market in value terms, although its market significance is greater in terms of numbers, because module prices are approximately 40-60 per cent lower than boards. For 2004, the whole embedded board market was worth US\$ 3,668 million; in 2008, it should reach US\$ 4,636 million. Market researchers are therefore

assuming overall growth of CAGR 33.57 per cent for COM til 2008. [2]

According to VDC, the most prominent form factors prior to COM Express were DIMM-PC, ETX, SOM144, and STX, sharing 51.6 per cent of the COM market, which VDC expects to increase. VDC classified comparable modules from Ampro Computers, Inc., Bright Star Engineering, Inc., Digital-Logic AG, PFU Systems, Inc., and TQ-Components GmbH as proprietary. [1]

Today, VDC indicates that ETX-based modules dominate the market, followed by proprietary COM designs; this ranking



*Zeljko Loncaric is Product Marketing Manager Module with Kontron*

[www.kontron.com](http://www.kontron.com)

is expected to remain the same in 2008, even if the new COM Express standard grows from today's 3 per cent to an impressive 16 per cent with the COMs and base boards in 2008. [3] In terms of open standards, the COM market is focusing on DIMM-PC, ETX and its derivatives, as well as COM Express (or ETXexpress - the trademark of the significant market player) as a new PICMG standard. Looking beyond x86 systems, E<sup>2</sup>Brain, a new COM standard for RISC-based systems, is also an option, although it is in a different league. We will look first at x86 COMs and the classification of the open form factors DIMM-PC, ETX, SOM144, and STX by VDC.

### DIMM-PC

The DIMM-PC form factor is the classic example of 386 to 586 system solutions which only need limited functionality and usually do not have graphics onboard. They offer a complete set of peripheral interfaces on a form factor smaller than a business card (40 mm x 68 mm) and serve often as a convenient alternative to *intricately* programmable microcontrollers.

DIMM-PCs use the DIMM slot, typically used in current PCs for memory modules, to connect to the

individual backplanes and to the ISA bus, I<sup>2</sup>C bus, and the usual I/O ports for keyboard, floppy, IDE hard drive, printer, serial interfaces and optional USB and LAN for headless applications via the 144 connections; expansion is possible using application-specific interfaces via the baseboard, or I/O cards in the same format as the DIMM-PC. If the required format for the PCI design is credit card-sized; the X-board COM form factor may be of interest.

### X-board

This COM concept is also an open standard. X-boards offer USB ports instead of legacy interfaces, such as keyboard and mouse, as well as PCI and I<sup>2</sup>C instead of ISA. Expansion is possible via Mini-PCI. These small computers are ideal for space-saving applications and are used, for example, in top-hat rail PCs and handheld computers. As a platform for various rugged PDAs, the X-board will increasingly offer RISC-based processors in the future and withdraw the range of x86 systems.

### ETX3.0 etc.

Apart from a few design differences, ETX3.0, SOM144, and STX essentially target the same types of



*The ETXexpress-CD with IntelCore 2 Duo ist he latest high-end COM and was first introduced on the Embedded World 2007.*

application. STX, designed by IBSmm Industrieelektronik Multimedia and first supported by AXIOMTEK, Delta Components GmbH, AMOTEC, and ROI, was accepted as an open standard by VDC. However, current product development at these companies leaves something to be desired; and ROI is now a member of the Kontron group and new Kontron COM-based designs will be implemented on ETX respectively ETXexpress.

ETX became the COM flagship within six years of its launch and received with the latest ETX 3.0 specification an appealing upgrade: As a fundamental improvement 2x serial ATA was implemented, with ETX3.0 computer on modules being 100 percent pin-to-pin compatible with previous ETX specifications. Furthermore a large number of providers have committed to the standard and its market share is correspondingly large. If DIMM-PC covers a maximum of 10 per cent of the market, ETX should end up with more than 40 per cent, if not 50 per cent, since the market share of open systems in 2002 was more than 51 per cent. Detailed market data can be found in the current VDC study, which can be purchased from VDC.

### COM Express/ ETXexpress

Brought into being at the end of 2003 by Kontron and Intel, ETXexpress was finally published by PICMG in July of this year under the neutral name COM Express; it has been largely unchallenged to date. COM Express is the trade name used by most providers of these modules. ETXexpress modules' primary function is to bring the fast PCIe bus onto COMs. How much new applications with fast peripheral demands can benefit from PCIe can be seen in the bandwidth of Gigabit Ethernet (125 MB/s), combined with ATA150 (150 MB/s), for example. If the communication of both interfaces runs over a PCI bus (133 MB/s), the maximum throughput of 275 MB/s cannot be achieved. With PCIe, there is no bottleneck: a standard PCIe interface (PCIe x1) offers 250 MB/sec – in both directions – so the PCIe lane has almost twice the bandwidth of PCI. Also, several lanes can be combined so PCIe has enormous performance potential, which predestines it to be the dominant datapath for upcoming x86 systems.



*ETX-LX 3.0: The ETX-LX is the first COM applying to the ETX 3.0 specification with SATA on board and 100 percent pin-to-pin compatible to previous ETX base board designs.*

## PRAXIS PROFILINE – Computer-On-Modules

First Edition, February 2007  
Order-No.: 1944-7  
ISBN 3-8259-1944-7

## Publisher

Vogel Industrie Medien GmbH & Co. KG  
Redaktion PRAXIS PROFILINE  
Max-Planck-Str. 7/9  
97064 Wuerzburg, Germany  
Tel.: +49 931 418-2420  
Fax: +49 931 418-2543  
E-Mail: [contact@praxis-profiline.de](mailto:contact@praxis-profiline.de)

## Editor-in-chief

Armin Schwarz

## Editor

Thomas Sümmerner

## Contributors to this issue

Michael Hennen (SAMS Network)  
Christof Wilde (SAMS Network)

## Assistant to the Editor

Anja Kemmer

## Layout

Carolin Tomschik, Vogel Services GmbH & Co. KG, 97064 Würzburg

## Titel

Carolin Tomschik

## Managing director

Ralf Eberhardt

## Availability

Fax orders can be sent to the publisher at:  
Vogel Industrie Medien, Wuerzburg/Germany  
Fax: ++49 931 418-2543  
In case of fax orders you will get an invoice about  
19,80 € plus shipping cost.  
(2,50 € – Germany, 5,- € foreign countries)

## Trademarks and Pictures

All trademarks used are property of the owner.  
Some photos and drawings are property of the involved companies.

## Printing

Vogel Druck und Medienservice GmbH & Co. KG

## Place of jurisdiction

Wuerzburg/Germany

## Internet-Addresses

[www.praxis-profiline.de](http://www.praxis-profiline.de)



Our front cover: The picture above shows the draft from Computer-on-Modules (Source: Kontron). The picture below shows the end version, from Carolin Tomschik.



## TRADEMARKS AND COPYRIGHT

DIMM-PC®, ETX®, ETXexpress®, microETXexpress™, X-board®, DIMM-IO® and DIMM-BUS® are trademarks or registered trademarks of Kontron Embedded Modules GmbH. Kontron is trademark or registered trademark of Kontron AG. All other brand or product names are trademarks or registered trademarks or copyrights by their respective owners and are recognized.

Kontron Embedded Modules GmbH is a founding member of the ETX® Industrial Group the purpose of which is the definition, marketing and promotion of the Embedded Technology eXtended (ETX®) Industrial Standard.

Kontron Embedded Modules GmbH has significantly contributed to the development and promotion of the ETX® Industrial Standard and administrates the ETX® Industrial Group's website ([www.etx-ig.com](http://www.etx-ig.com)). Kontron Embedded Modules GmbH is the owner of the ETX® trademark which is protected as a registered trademark under various jurisdictions worldwide. Kontron Embedded Modules GmbH has licensed the ETX® trademark to all members of the ETX® Industrial Group. All members of the ETX® Industrial Group have committed themselves to fulfilment of the current specifications of the ETX® Industrial Standard which can be downloaded from the ETX® IG's website.

Companies which are not a member of the ETX® Industrial Group are not authorized to use the trademark ETX® for their products. Neither the ETX® Industrial Group nor its members can monitor the compliance of third parties with the ETX® Industrial Standard's specifications. More information on how to become a member of the ETX® Industrial Group as well as on the terms of use of the trademark ETX® can be downloaded from the website of the ETX® Industrial Group ([www.etx-ig.com](http://www.etx-ig.com)).

### The COM Express/ETX-express specification

Boards with the new standard measure 95 mm x 125 mm and, in the basic version, offer eight PCIe x1 lanes. The variant microETXexpress is a bit smaller (95mm x 95mm) with 100% compatible footprint and identical pin out. An x16 lane is included in the standard for applications that require a dedicated graphics processor. Besides PCIe, ETXexpress offers 32 bit PCI and LPC (as a replacement for the ISA bus).

Thus, access to designs and assemblies available today is guaranteed. Moreover, components that do not conform to PCIe, such as PCI/PCI-X slot cards, can optionally be supported via a PCI 2 x 32 bit interface. Four serial ATA interfaces and a parallel ATA interface are available for connecting storage media. Besides these individually usable interfaces, ETXexpress provides a Gigabit Ethernet port and eight USB 2.0 ports and ETXexpress supports dual-channel storage technology. In addition, all ETXexpress modules offer LVDS

FORM FAKTOR	FORM FAKTOR IN CM <sup>2</sup>	PINS	I/O BUS EXPANSION NOT LINKED TO FUNCTION	RECOGNIZED AS OPEN STANDARD BY VDC STUDY OR PICMG STANDARD
DIMM-PC	27,2	144	ISA and I <sup>2</sup> C	yes
X-board	32,83	200	PCI and I <sup>2</sup> C	no
SOM144	68	144	PCI	yes
STX	87,93	400	PCI and ISA	yes
ETX	114	400	PCI, LPC and ISA	yes
E <sup>2</sup> Brain	86,25	440	PCI LPC, I <sup>2</sup> C,	no
microETXexpress	90,25	440 (not all used)	PCI or PCI and PCI Express and LPC	Conforms to PICMG COM.0 with limited pin layout
ETXexpress/COM Express	118,75 (Basic)	440	PCI Express and PCI	yes

multimedia ports and serial DVO, as well as ACPI (Advanced Configuration and Power Interface) for optimized power management. All the interfaces – as in all other open COM standards – are implemented in the same place on each module in order to guarantee scalability within the module family in future. Signals are transmitted via two 220-pin SMT high speed connectors; not all of the pins are currently used: some are reserved for future chipsets and processors. Six mounting holes mean that the board can be securely fixed and make it shock and vibration resistant. Furthermore, as with ETX, heat is dissipated via a

thermal interface, the standardized heat spreader.

### Streamlining leads to economies of scale

In contrast to the variety of form factors that exist for SBCs, motherboards, and slot assemblies, it seems that there is little room for different formats in the COM market, and only a few COM standards have been able to assert themselves. Why is that? Essentially, the choice of the right form factor for COMs made according to the expansion bus which is implemented, because, as with SBC and motherboards, most customer-specific functions are connected via the bus. In one version via expansion assemblies, with COMs on the baseboards, or via additional slots on the baseboard, again via expansion assemblies. The number of variants is thus very limited. The only ones worth mentioning are ISA, PCI, and PCI Express, as the dominant PC buses, and I<sup>2</sup>C and LPC as supplemental buses. Thus, the only difference between systems based on SBC/motherboards and those based on COMs is the amount of in-house development necessary. With SBC/motherboards, either nothing at all is developed in-house and the functions of the system are implemented entirely by COTS assemblies, or only special expansion assemblies are developed in-house. With COMs, the share of in-house development is larger, because the buyer of the COM defines the final function of the system. In terms of the most commonly used COM standards,

there are only as many varieties as there are buses: ETXfor PCI, ETXexpressfor PCI Express etc. At most, two related buses can be combined in order to allow for evolution of systems. With ETX, it made sense to place ISA alongside PCI. ETXexpress has PCI Express and also PCI. ETXexpress modules that conform to PICMG COM Express can be used immediately. Hopefully, uncertainty will not be generated in the market by too many diverse alternatives being touted to users in the coming years. Experience dictates that it is not wise to rely on also-ran products, since these have demonstrably not prevailed.

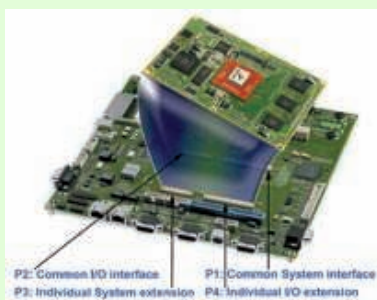
### Last but not least

This short overview provides a pragmatic basis for the choice of the appropriate COM solution. Other than the trio from the field of x86 COMs, there are, of course, other COMs on the market; however they are only of secondary importance and are mostly proprietary technology.

More information:  
[www.kontron.com/pp05](http://www.kontron.com/pp05)

### RISC-COMs –COM STANDARDS FOR SPECIAL APPLICATIONS

With the publication of the E<sup>2</sup>Brain specification in 2005, the first open Computer-on-Module standard for RISC-based systems is available based on PowerPC, PowerQuicc, and XScale. The specification can be downloaded from <http://www.e2brain.com/>. The new open Computer-on-Module standard E<sup>2</sup>Brain offers an economical alternative for cost-sensitive embedded computer applications, where, in the past, proprietary designs have predominated. The use of swappable and scalable standard modules offers system integrators a significant reduction in time-to-market. Up to now, these advantages were limited to developments with x86 technology. With the



*E<sup>2</sup>Brain, the RISC-based alternative to COM with a supply guarantee for ten years or more*

E<sup>2</sup>Brain standard, RISC-based applications are accessible as well. In general, E<sup>2</sup>Brain modules stand out thanks to their high processing and communications performance with low energy requirements and are often available with an extended temperature range from -40 °C to +85 °C and a supply guarantee for ten years or more.

### LINKS

- [1] <http://www.vdc-corp.com/embedded/press/03/pr03-12.html>
- [2] <http://www.vdc-corp.com/embedded/white/05/05mcbreavol5.pdf>
- [3] <http://www.vdc-corp.com/embedded/annual/05/br05-17.html>

# Teamwork with COMs

## More service for developers – Armin Schwarz talks with CTO Dirk Finstel of Kontron Embedded Modules

■ **As a Computer-On-Module (COM) supplier you used to be a competitor and today you are a partner for electronics developers. How did you do it?**

That's right. In the past many developers were unsure whether they should take the chance of using COMs, which means letting others handle the CPU core development. For many, it's particularly attractive to be able to "get their hands on" the latest processor technology. But, let's be honest. The people who offer CPU

development at this level today have to come to companies like Kontron. Today developing COM architecture requires the investment of several hundred thousand Euros which means that COM product purchases will continue to increase. CPU Core developments are our core competence and every year we strengthen this by reinvesting almost 14 percent of our profits back into development.

**That sounds very pragmatic! Isn't there some solution in between?**

Of course there is. Otherwise there wouldn't be any growth in the future! There will always be customers who do not outsource this technology. Reasons for this vary from technological to security and also business concerns. But, every year more and more OEM customers turn to Kontron because there is no economical reason for performing CPU core development themselves. The only acceptable solution for OEMs with very large production quantities is to license the CPU and chipset design data so that full custom designs can be implemented, which reduces handling costs in production and assembly.

*Dirk Finstel  
is Chief Technical Officer  
at Kontron Embedded  
Modules*

All other designs which cannot be implemented on standard boards or slightly modified standard boards must use COMs to remain competitive over the long term.

**How large do you estimate the COM market to be?**

The market for merchant boards and merchant COMs does not cover the whole embedded computing market by a long shot. We estimate that today more than 70 percent of the processors utilized in the embedded market are still being used in customer-specific designs. To put it another way, during the last six to eight years since the first COMs were launched, COMs have been able to capture around 30 percent of the potential designs (although back then we assumed 80 to 90 percent were full-custom designs). In about 20 percent of the current total market, we believe developers will continue to implement their own CPU designs because few companies in this category manufacture large numbers of products. So, the remaining 50 percent of the market is made up of companies whose conservative structure has so far rejected the idea of using externally developed solutions, often because they have felt that the technology was still new and the providers were relatively small.

**Has this situation changed?**

Yes. Absolutely. Much has happened since 2000 when ETX was

presented for the first time. Like Kontron, globally active providers have formed which, like us, employ a staff of more than 2400 employees and which offer large, reliable and inexpensive manufacturing capacity and experienced service and support. Today the market is more matured. There is no plausible economic reason left to retain CPU development at the OEM.

**What does this mean for COM providers?**

Today we no longer need to travel the countryside like prophets preaching the advantages of COMs to OEMs. Today it's a fact that COMs offer the best solution for customized CPU Boards. Instead, today we must offer further added value in addition to a wide portfolio of COM products so that we can differentiate ourselves from other providers.

**How do you do that?**

We try to exceed the expectations of our customers. This includes all services from the first sales talk to clear handling of product life cycle management to comprehensive design-in and after-sales support. When you start off, you begin, of course, with a well-rounded product portfolio and with all your homework done. The problem for an OEM is not to find a suitable COM, but to determine whether that COM will also function correctly under all required software and I/O configurations.

This requires a lot of development effort and it is important that this work be done before a problem occurs. We place great store in this. Many studies confirm that we achieve these goals. For example, for the last three years VDC has awarded Kontron the status of "Platinum Vendor" based on customer surveys. This is the highest honor for manufacturers of merchant boards which can be awarded worldwide and we are continuously working to improve our processes in the future.

**You just said that the products themselves no longer monopolize the center of attention but then you continue to base your arguments on product features.**

Product features will be soon defined by the bare feature set. Comprehensive board support packages (BSPs) and standardized software add-ons are not noticed until much later. Frequently other criteria come into play, such as "on site presence": you will chuckle at this, but some customers choose a supplier only because the company's building is "just around the corner." That is not totally wrong, but also not right per se. However, it is a proven fact that a functioning BIOS, well-organized drivers and world-class version management are quality factors which must not be underestimated: it is just such factors which give our systems long-term availability when, in these days of fast-moving software evolution, it is easy to forget one update or another. And that's all the more true for smaller COM providers with perhaps at most 50 employees. This is naturally different at companies like Kontron. For example, we have implemented dual-core not only on COMs, but also on seven additional board-level products and in six system architectures. This makes development doubly worthwhile for us and thus for our customers.

**I see what you mean. However, smaller competitors are not the players against whom you really have to compete. Surely there are also providers in the COM market who are comparable to Kontron?**

The market has consolidated during the past few years and will continue to consolidate since we have reached the phase of maturity where a few providers will share an increasingly larger piece of the whole pie. As far as the number of employees goes, only Advantech

is a comparable competitor, but it does most of its business in Asia. In Europe our lead is clear and as the only provider with headquarters in Europe, we are a premier member of the Intel Communications Alliance and "Member of the Year 2006." All of the other global players are concentrating on other form factors (such as, for example, AdvancedTCA) and are running the risk of supplying a very cyclic market without being able to generate sales from other sectors to make up for this market's

periodic drops in demand. However, these players are currently not important to the COM market. In contrast, COMs are suitable for many sectors and support Kontron's diversification. This means that COM providers are for the most part independent of specific trends of certain markets and thus solid business partners for large OEMs with whom we maintain a partner-like relationship and whose developers recognize us as team workers.

**How would you describe teamwork with your customers' development teams?**

For us in particular, teamwork means doing our homework since that is the duty of every team member. That includes all individual services which our customers observe as added value. We call these Embedded Value Adds, which we combine into a well-rounded comprehensive offering and from which our customers' developers can choose the components which they need. This includes a well-rounded product portfolio as well as schooling and training programs. Equally important are features such as finished solutions for Smart Battery Management (see article on page 28); the individual graphic links to our Flatpanel solutions (see article on page 26); or the development of special Baseboards (see article on page 27). Additionally, we always welcome questions from our customers on every embedded subject. We try to immediately provide a suitable answer. For example, we are experts on Flash memories (see article on page 32) and will publish books e.g. on Mobile Linux, so that we can help customers with important design decisions. The purpose of this is to make our customers feel well cared for. Suggestions for improvement are always welcome!

For more information:  
[www.kontron.de/ppoz](http://www.kontron.de/ppoz)

#### EMBEDDED NEWS

##### INTEL RECOGNIZES KONTRON AS "PARTNER OF THE YEAR"

Intel honored Kontron AG at this year's Intel® Communications Alliance (ICA) Congress in Arizona, USA as "ICA Partner of the Year 2006." With more than 200 members around the world, the Intel Communications Alliance is Intel's partner program for embedded computer manufacturers, particularly in the area of telecommunications. Only four of these members enjoy Premier status. With this honor, Intel selected Kontron as the most important partner in the embedded industry for the fiscal year 2006. The award is based on exceptional growth, technological leadership and the innovative strength of Kontron within the embedded computer industry.

##### E<sup>2</sup>BRAIN INTEREST GROUP

Together with four other companies, Kontron AG founded the E<sup>2</sup>Brain Interest Group (Embedded Electronic Brain). MAZeT and Ultratronik are from Germany. On the international scene, Odyssee (France) and UniControls (the Czech Republic) are the first companies to join. The goal of the E<sup>2</sup>Brain Interest Group is the mutual further development and marketing of RISC-based COMs based on E<sup>2</sup>Brain – the COM Standard recently disclosed by Kontron. The founding of the IG strengthens E<sup>2</sup>Brain's claim to be a standard. Users profit in particular from expanded services surrounding E<sup>2</sup>Brain and a more differentiated RISC-COM product palette.

##### BOOK ENTITLED "LINUX GOES MOBILE" SOON AVAILABLE

Matthias "Kalle" Dalheimer and Michael Klar, well-known developers in the open source community, will produce their first book "Linux Goes Mobile", covering the development of Linux-based mobile devices. It will be published in German and English by Franzis in cooperation with Kontron, illustrated on the ePDA with an Intel Xscale 80219 processor based X-board<GP8> COM. The X-board<GP8> is the ideal platform for high-performance and mobile applications. To go along with the book, an inexpensive starter kit is available for immediate evaluation. For further information on the book, go to [www.kontron.com/x-board](http://www.kontron.com/x-board).

##### PRODUCTION CAPACITY EXPANDED

Together with local management, Kontron's subsidiary Kontron Asia, Inc. of Taipei took over the production plants and operations of Three-Five Systems, Tempe AZ in Penang, Malaysia, at the end of 2005. This provided Kontron with a perfect solution to a continuously increasing backlog of orders for its embedded computer technology in the region. Since the first quarter of 2006, the existing Asian production of Kontron Taiwan has been integrated into the new location. This has more than doubled our own manufacturing capacity from 250,000 embedded computers per year to 600,000. Initial manufacturing orders for series production were accepted immediately after the takeover. Maximum capacity utilization is already predicted to be reached this year.

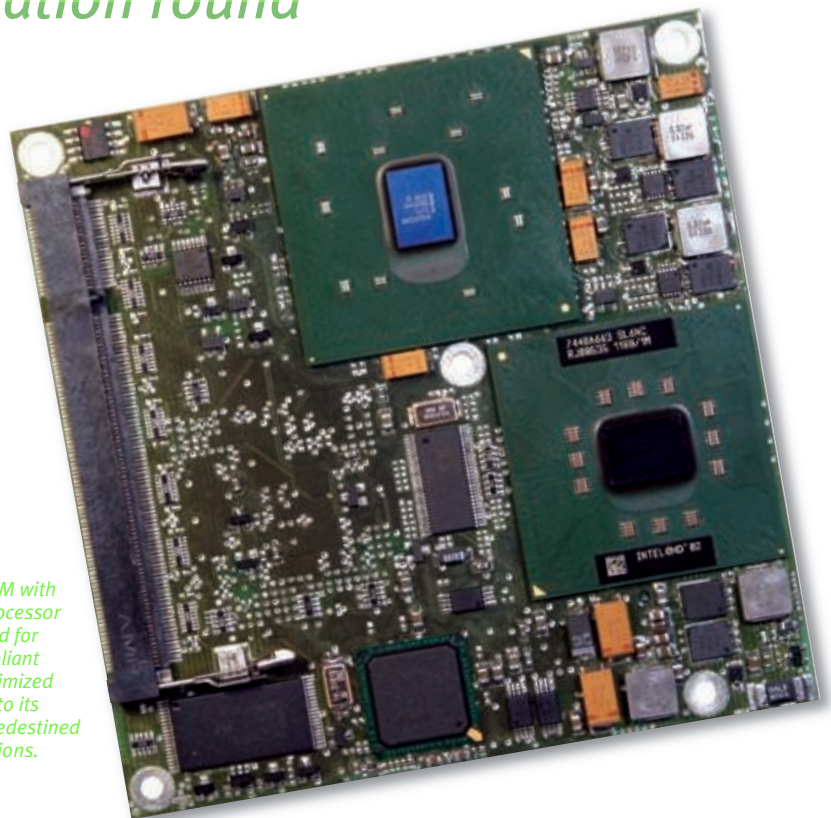
# Small Footprint, Great Potential

## *microETXexpress heralds the second COM Express standardization round*

*microETXexpress was developed in response to the huge demand for PCI Express-based COMs in the segment for microapplications such as mobile applications. It takes the shape of more compact COM Express module and is compatible with other ETXexpress/COM Express products.*

Martin Bodenschatz

*microETXexpress-PM with Intel Pentium M processor is the starting board for COM Express-compliant designs with a minimized footprint and, due to its compactness, is predestined for mobile applications.*



The goal of microETXexpress is to build PCI Express-based COMs on the smallest possible form factor. Kontron will propose that this compact form factor be added to the PICMG controlled COM Express standard and be given a neutral name of "Compact COM Express". The already approved COM Express standard allows for this in concept but has yet to be adopted. This Compact COM Express standard will also provide a pure PCI bus version. The inclusion of PCI is highly interesting for developers of current systems: The baseboard connector specified in 2000 for ETX provides only limited support for the

latest processors. The new connector for COM Express, however, has substantial room for growth: this results in the availability of a reliable new COM standard for PCI-based designs that can also continue to integrate the latest high-end processors. Several manufacturers have already demonstrated their commitment to this new Compact COM Express form factor. Kontron will launch the new standard Compact COM Express under the trademark "microETXexpress."

The mechanical design of the new 95 x 95 mm (3.7- x 3.7-in) form factor essentially differs only in one aspect: size! Other than

this, the only other difference is the inclusion of an additional mounting hole in the upper right corner for securing the small module to a COM Express application-specific carrier board.

### **ETXexpress/COM Express: Specifies three different formats**

ETXexpress Basic (COM Express Basic) measures 125 x 95 mm/4.9 x 3.7 in = 118.75 cm<sup>2</sup>/approx. 18.5 sq in (100 per cent) microETXexpress (the proposed COM Express Compact) measures 95 x 95 mm/3.7 x 3.7 in = 90.25 cm<sup>2</sup>/approx. 14.0 sq in (76 per cent).



*Martin Bodenschatz is Product Marketing Manager at Kontron.*

[www.kontron.com](http://www.kontron.com)



ETXexpress Extended (COM Express Extended) measures 155 x 110 mm/6.1 x 4.3 in = 170.5 cm<sup>2</sup>/approx. 26.4 sq in (143.58 per cent).

### Specification details can be transferred on a „copy & paste“ basis

Everything extending beyond the physical limitations of the new, smaller COMs is eliminated, of course. However, what remains the same is the positioning of the two high-speed connectors in relation to the baseboard. Thus, numerous specification details can be transferred on a "copy & paste" basis, thereby providing advantages beyond ease of documentation.

The pin assignments for the new compact microETXexpress conform to COM.0 (pin-out type 2) and are hence identical for PCI and PCI Express as well as for all peripheral, network, and memory interfaces, including PCI, IDE, LAN, and 6 x

USB 2.0. The user can therefore design-in PCI Express and SATA in advance on a single baseboard; if they are needed later, a change of modules allows them to be used immediately. PCI and/or PCI Express support is provided by the chipset. microETXexpress with SATA and PCI Express in this new compact format are already available with microETXexpress-PM.

Ultimately, with a single carrier board, both microETXexpress and ETXexpress can be supported with full scaling for processors, IDE to SATA, PCI to PCI Express, and 10/100 to GigaBitLAN, to ensure that the system is capable of handling all future demands.

The greater simplicity of PCB layout for baseboards with PCI Express due to the lower number of tracks per bus segment provides a real advantage for developers, since everything else can mostly stay the same.

### High performance for PC-based PLCs

With the launch of the new form factor for PCI and PCI Express-based designs with new high-performance connectors, a clear line was drawn simultaneously to ETX designs and their former derivatives and new modifications: everything that needs to deliver more energy via the connector (but not more performance) should be equipped with microETXexpress-compliant COMs. Every design with the connector for ETX (or more recent designs) will automatically reach the limits of what is possible much sooner than COM Express-compliant designs will. The step of expanding the COM Express specifications further in the direction of smaller variants also caters to users' desire for paying only for what they really need. High-performance graphics cards with PCI Express x 16 lanes are, for example, not really required

for PC-based PLCs. Nevertheless, large PC-based PLCs need to have high performance. In that regard, the two new standards perfectly round out the product family developed around ETXexpress. The new specifications, documentation, and manuals have been published as an open standard. Experience has shown that the PICMG standardization process could take some time because procedures and appeal deadlines must be complied with. Because, however, the new standard drafts involve variants of COM Express, the PIN assignments agreed on by the currently participating companies will not be disputed: ultimately, every designer is striving for the most EMC-compliant design. In addition, PICMG has agreed in principle to support this type of standard expansion.

More information:  
[www.kontron.com/pp07](http://www.kontron.com/pp07)

## Certified Design Partner

### Value Adds for COMs by Certification for independent Baseboard Design Companies

Due to the rapidly growing demand for custom baseboard designs that support the latest technologies including PCIe and multi-core, Kontron expands and reorganizes its ETX Certified Design Partner Program (CDP) that was originally founded in the year 2000.

The revamped ETX CDP will support additional ETX design partners and also Certified Design Partners for ETXexpress/COM Express Computer-On-Modules, micro-ETXexpress, X-board and DIMM-PC.

With the expansion and reorganization of the Design Partner Program Kontron wants to enhance support for a wider spread of Kontron Certified Design Partners.

The advanced ETX CDP will offer more value added



certified services for OEMs that choose to outsource their entire hardware design. Computer-On-Modules are ideal for custom applications that need many special features in that flexible way. Kontron Certified Design Partners offer very quick-to-market and reliable baseboard projects.

The new community of certified baseboard designers that support Kontron's expansive product families of highly integrated Computer-On-Modules is starting with seven global members:

- ▶ ACCES I/O Products
- ▶ b-plus,

- ▶ datakamp System
- ▶ Diamond Point International,
- ▶ ies Industrie-Elektronik Schmitz,
- ▶ WOLF
- ▶ World Micro.

Further companies are already in the certification process. Experts in developing dedicated solutions from industrial computing, communications and defense to mobile, multimedia, medical and other emerging industries are invited to join the Kontron Certified Design Partner Program for COM baseboard designs.

More information about the ETX Certified Design Partner Program is available at:

<http://www.etx-cdp.com>

# ETX 3.0

*Sound Investment for Hundreds of Thousands of ETX Designs with New High-End Performance including ISA-Support*

*The new ETX 3.0 specification found numerous supporters right from the beginning. This makes the introduction of ETX 3.0 the fastest de facto standardization process in the history of the embedded computer industry.*

Dirk Finstel



*ETX-LX 3.0: The ETX-LX is the first board from Kontron built in accordance with the ETX 3.0 Specification, with SATA on board and 100 percent pin-to-pin compatibility with previous ETX Baseboard Designs*



*Dirk Finstel is CTO of Embedded Modules Division, at Kontron*

[www.kontron.com](http://www.kontron.com)

■ Since Specification 3.0 was passed, 10 leading providers worldwide have announced support for the updated version of the most used Computer-on-Module (COM) standard - ETX. More providers are also planning to support ETX 3.0 in the near future.



**Integration of 2 x SATA**

As primary expansion, ETX 3.0 includes two SATA interfaces; it also retains 100 percent pin-to-pin compatibility with the predecessor ETX specification. The two SATA interfaces are implemented with plug connectors on the ETX module itself, so that existing baseboard designs do not have to be changed to allow the use of SATA hard drives. ETX 3.0 also defines USB 2.0 communications via existing ETX plug connectors.

The ETX 3.0 specification emphasizes the ETX Consortium's intention to continue ETX support for many years to come.

Whoever needs PCI-Express uses ETXexpress/COM Express that has already been confirmed by many design-wins today. ETXexpress is 100 percent compliant with the

COM Express specification as defined by the PCI Industrial Computer Manufacturers' Group (PICMG) and was defined for the new PCI Express bus architecture.

**ETX-CD – Dual-Core-Performance for ETX 3.0**

With the launch of the ETX-CD with Intel Core Duo processor in October 2006, Kontron underscores the long-term availability of ETX. Thanks to the double-core processor, the RoHS compliant ETX-CD is currently the absolute

high-end COM for ETX 3.0-based developments. Configured with various Intel Core Duo processors and the Mobile Intel 945GM Express chipset as well as up to 2-GByte DDR2 SODIMM, it offers the highest computing and graphic performance with an internal 950GMA graphics controller and comparatively low power loss.

*More information:*  
[www.kontron.com/ppog](http://www.kontron.com/ppog)

**THE ETX 3.0 SUCCESS STORY**

- March 2006:** ETX 3.0 specification passed  
Kontron, Adlink and MSC support the new specification
- April 2006:** Evalve joins supporters
- June 2006:** Aaeon, Seco, Arbor, Axiomtek and Blue Chip Technology also support ETX 3.0
- October 2006:** Advantech, founding member of the ETX Industrial Group, joins ETX 3.0 supporters and collaborates with Kontron on forthcoming Revision 3.01.

# Multi-Core-COMs

*One processor, two cores, many options for COM Express/ETXexpress-based designs*

*Embedded designs with Intel Core Duo technology on ETXexpress modules in conformance with COM Express are enjoying a break-neck-speed increase in demand for many applications.*

Josef Fromberger

The idea behind the success of multiple processors is to counter the so-called „GHz Race“ and its high power consumption, with parallel-functioning computer cores which offer increased computing performance and moderate power consumption. Use of mobile computers in particular has encouraged this trend. This means no performance restrictions for the processor boards and modules designed for low power consumption. Additionally, multi-core technology offers independent, asynchronous utilization of the respective computer cores for „hybrid“ tasks in a single embedded system. This means that the freedom in design of COM-based devices



Josef Fromberger is Product Line Sales Manager for COMs at Kontron

[www.kontron.com](http://www.kontron.com)

and systems continues to grow. All processing power and interfaces are concentrated on one 95 x 125-mm module. A uniform concept for heat dissipation simplifies the mechanical requirements when the device is subsequently designed.

COM Express, the predominant standard for COMs specified by the PICMG, is designed so that the performance of modern processors and their chipsets can be fully utilized. The specified performance capability of the computer components must be transmitted with high signal quality to the baseboard for the computer system. The recognized standard minimizes design risk over many years. Suitable transmission media, such as the plug connectors to the baseboard which are designed for full-bandwidth operation, ensure high functionality. Proprietary developments frequently lead to a dead end which means that they must be redesigned later.

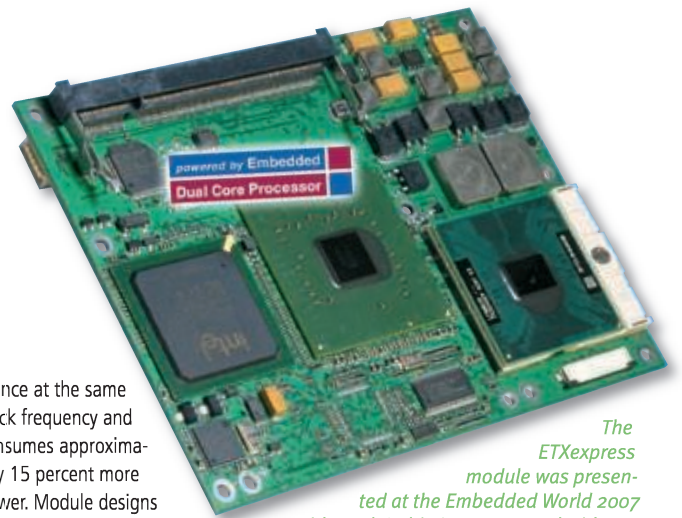
## Dual-core technology on modules

The introduction of dual-core technology on a module was started at the 2006 Embedded World event in Nuremberg. Kontron presented an ETXexpress module, which complies with COM Express standard, built around the Intel Celeron M 423 (1.06 GHz), Intel Core Duo processor L2400 (1.66 MHz) and T2500 (2.0 GHz) embedded processors. ETXexpress conforms fully to COM Express, but still offers its own IPs (Intellectual Properties) which simplify its integration in embedded designs. This high-end ETXexpress module is designed especially for performance-hungry applications. It achieves almost double the perfor-

mance at the same clock frequency and consumes approximately 15 percent more power. Module designs that require optimal power consumption are the prerequisite to longer-lasting storage batteries in mobile applications.

## Module performance can be expanded

Applications with high data throughput, real-time demands with different operating systems, and high graphics performance are already taken care of with ETXexpress Core Duo modules. Available interfaces include up to 5 PCIe x1 ports, PCI, LPC, 8 USB 2.0, 1x GBit Ethernet, 2 serial-ATAs or parallel-ATAs. This module includes the Mobile Intel 945GM Express chipset, offering flexible and high-performance display links for demanding graphics applications. Standards such as EDID and Kontron's own JIL3 interface make it easier for the user to link various displays of different resolutions and sizes. The resounding success of COMs technology that found its starting place with ETX is now being continued with COM Express. However, it is still worthwhile to add a Core Duo module with 945GME/ICH7 chipset to the ETX-Standard



The ETXexpress module was presented at the Embedded World 2007 with Intel 64-bit Core2 Duo and with 2 or 4-Mbyte L2 Cache.

3.0 (upwards-compatible integration of serial ATA drives on the module). This ensures that scaling will be possible in higher-performance processors for the wide variety of ETX-based designs without having to make expensive changes to existing baseboards. Module performance can be functionally expanded by using dual-channel DDR memory - also implemented on ETXexpress modules. The next generation of processor performance will be the Intel Core 2 Duo processor T7400 at 2.16 GHz, run on ETXexpress with the 945GME/ICH7 chipset - producing a further, noticeable increase in performance with only a slight increase in power consumption (3 Watt TDP / compared with the T2400 Core Duo). In addition to Intel, other manufacturers are also planning additional multi-core designs which promise to be useful for ETXexpress modules, particularly for performance-hungry graphics applications.

More information:  
[www.kontron.com/pp08](http://www.kontron.com/pp08)

# A Standard for Embedded RISC-COMs

## Define the choices

Many embedded computer users have known and taken advantage of the benefits of RISC (reduced instruction set computers) versus x86 CISC (complex instruction set computers) processors for years. One of the main advantages has always been one of the main drawbacks – the variety of RISC choices has prevented a standard approach to specifying portions of the RISC design.

Winfried Wolf



Winfried Wolf is product manager E<sup>2</sup>Brain Module for Kontron

[www.kontron.com](http://www.kontron.com)

An analysis of RISC applications has allowed the definition of a standard RISC computer on module. However, the problems associated with embedded applications must be understood to appreciate the proposed standard.

### Choosing RISC vs. x86 for Embedded Applications

The Computer-On-Modules market currently is x86 centric with a multitude of different standards and numerous proprietary solutions. See sidebar for more details. These modules differ in size and some minor features, but all of them have one thing in common: the products are more or less PC compatible. They provide all the interfaces demanded by Windows operating systems and the ones PC users are used to working with. The main variable is the CPU performance specified in x86 variations, such as Pentium, Core Duo, etc. In general, CISC x86 processors have fix defined interfaces such as IDE/SATA, PCI/PCI express, serial, and USB. RISC processors on the other hand have a greater variety of interfaces that include PCI, LPC, I<sup>2</sup>C, Ethernet, serial, and more.

In addition to the interfaces, the picture is quite different with RISC CPUs such as PowerPC or XScale processors. Since there is no standardized system architecture (like the PC for x86) RISC CPUs have spawned a number of proprietary designs. In addition to the interfaces mentioned earlier, RISC architectures also include multiprotocol serial for example HDLC and Utopia). Table 1 provides a comparison of two RISC processors from one supplier.

The table shows that RISC CPUs, unlike x86 processors, are not just “general purpose CPUs,” but are designed to fit to the needs of dedicated application areas. These processors frequently provide a multitude of communication interfaces, but typically not more CPU performance than a WLAN gateway, intelligent router, or other target application requires. For example, in table 1, both products integrate a second RISC engine (Communication Processor Module) to offload the communication tasks from the main RISC processor and provide lower power consumption. However, the one unit has four Serial Communication Controllers and much more memory. As a result, the chip size (silicon area) for any particular application is based on the computing core and peripherals required for that application. Since smaller chip size means lower cost, there are considerable variations in RISC processors to meet the various application cost targets.

### Simplifying the Alternatives

Based on the variety of applications, a standardized Computer-On-Module platform for RISC CPUs needs considerably more I/O flexibility to host all the different CPU interfaces. Nevertheless, keeping a common system and I/O interface ensures a certain amount of compatibility and upgradeability. This requires some amount of compromising between an individual custom design with strictly dedicated interfaces on one hand, to a standard approach that achieves compatibility and upgradeability on the other hand.

The size of a standardized module must consider several areas. On one hand, it must be small enough to fit into small embedded systems such as handheld devices. At least three units should fit on a 6U carrier board to satisfy common requirements in networking, industrial automation, and military applications. On the other hand, it has to have

FEATURES\PROCESSOR	FREESCALE MPC855T	FREESCALE MPC860P
Performance	105 MIPS @80 MHz [1]	106 MIPS @80MHz [1]
Communication Processor Module	Yes	Yes
Serial Communication Controller	1	4
Other Serial Channels	(2) SMCs, (1) SPI, (1) I2C	(2) SMCs, (1) SPI, (1) I2C
I-Cache	4	16
D-Cache	4	8
Ethernet	10/100	10/100
ATM	Yes	Yes
Multi HDLC	Yes	Yes
Package size	357-pin BGA	357-pin BGA
[1] Using Dhrystone 2.1		

The variations within a single semiconductor companies RISC family are obvious. The increased number of Serial Communication Controllers and increased amount of memory address different application requirements.

sufficient area to provide the necessary space for powerful processors and their chipsets that could take as much as 16 cm<sup>2</sup>. RISC CPUs are low power devices by nature, but a module hosting a high-end PowerPC must be able to cope with 20W power consumption and the resulting heat dissipation (thermal envelope). A typical member of the RISC family - the PowerPC - frequently operates in harsh environmental conditions such as industrial control, military or transportation applications due to its real time features, an excellent MIPS/Watt ratio, and long-term availability.

Many applications require an extended temperature range from -40 °C to +85 °C and a supply guarantee for more than ten years. For that reason, a RISC Computer-On-Module platform targeting these applications must be robust with all components soldered to the PCB to withstand shock and vibration. Mass storage with moving parts is not an option, since it would have difficulty meeting the shock and vibration requirements.

These and many other considerations have all gone into the definition of the RISC Computer-On-

<b>APPLICATION</b>	Cost sensitive embedded real-time control applications	Performance and bandwidth demanding embedded control and communication applications
<b>RISC MODULE</b>	EB405	EB8540
<b>PROCESSOR</b>	IBM/AMCC 405EP PowerPC	Freescale MPC8540/8541 PowerPC
<b>MEMORY</b>	16/64 MB SDRAM	128/256 MB DDR-SDRAM
<b>FLASH</b>	4/8 MB	8/16 MB
<b>INTERFACES</b>	PCI 32/33, LPC, I <sup>2</sup> C, JTAG/BDM, CompactFlash (IDE), 2/4 serial ports, dual Fast Ethernet	PCI 32/33, LPC, I <sup>2</sup> C, JTAG/BDM, CompactFlash (IDE), 6 serial ports, dual Gigabit Ethernet, Fast Ethernet, CAN
<b>POWER CONSUMPTION</b>	4W typ. (3.3V)	12W typ. (3.3V)
<b>PERFORMANCE (DHRYSTONE 2.1 MIPS)</b>	404	1850
<b>ADDITIONAL FEATURES</b>	Real-time clock, watchdog, 15 GPIO	Real-time clock, watchdog, temperature sensor
<b>DESIGN FOCUS</b>	Cost optimized	Highest performance

*Comparing the features and performance of a cost sensitive RISC board to an identical size high performance RISC board shows the versatility of the proposed standard. The two RISC processors from different manufacturers satisfy the applications while having drastically different memory, interface, and performance requirements.*

Module specification. In addition, the industry's field experience from years of x86-based Computer-On-Module design provided an excellent foundation and basis for layout and connector definition. As a result, a 4-connector, 115 mm x 75 mm board was chosen.

This newly defined standard can be viewed as a RISC version of the accepted Computer-On-Modules approach, which Kontron has dubbed, E<sup>2</sup>Brain™ modules. The modules are complete computer units with a

RISC CPU, memory, and interfaces. Power supply, physical interfaces for the ports, and possible required function expansion are implemented on a carrier board. The board-level methodology simplifies the choices without limiting the performance options for embedded RISC processors.

**Options Within the Standard**

Two extremes demonstrate the flexibility of the standard:

- (1) a low cost Computer-On-Module RISC product targeted at a cost sensitive real-time control application and
- (2) a high performance Computer-On-Module RISC product for a demanding control or communication application. An IBM/AMCC 405EP operating at 266 MHz provides 404 MIPS (Dhrystone 2.1) performance for the low cost application. Fitting with the same defined space, a Freescale MPC8540/8541 operating at 800 MHz provides 1850 MIPS (Dhrystone 2.1) and low power consumption for the high performance application. Table 2 shows the summary of key features of these two modules.

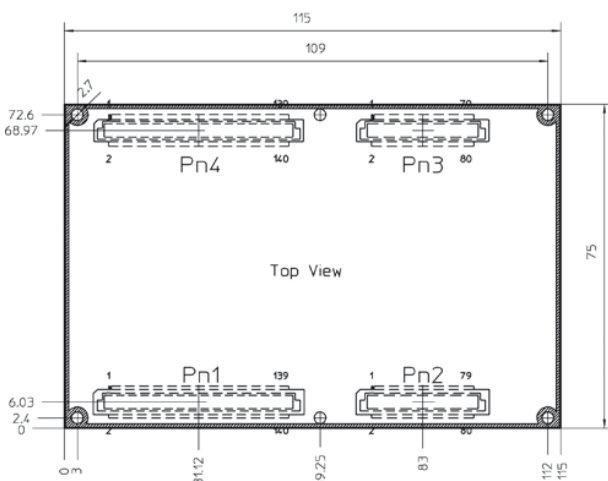
E<sup>2</sup>Brain takes advantage of the RISC processor interfaces and offers a fixed interface set, including PCI, LPC, I<sup>2</sup>C, 1xFastEthernet, 2xSerial, and 1xCompactFlash. These individual interfaces are not standard

on CISC processors or CISC-based modules. To create module families focused on communication or automation, E<sup>2</sup>Brain uses the individual interfaces (up to 2x FastEthernet or GigaBitEthernet, and Multiprotocol Serial, for example HDLC and Utopia) of each processor. The E<sup>2</sup>Brain approach to a Computer-On-Module standard for RISC provides a means of addressing application areas including: networking, telecom, datacom, industrial control, transportation, military, and medical. The form factor provides scalable performance and upgradeability as well as the flexibility to use a variety of RISC processors. Consideration for ruggedness and extended temperature range in the most critical applications ensures a successful design for the entire range of targeted applications.

*More information:*  
[www.kontron.com/pp10](http://www.kontron.com/pp10)

**E<sup>2</sup>BRAIN**

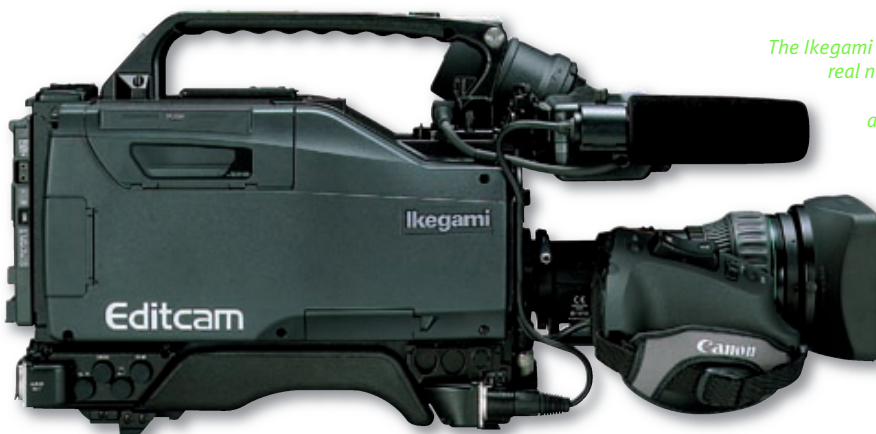
The specifications for E<sup>2</sup>Brain were first published in May 2005. Only eight months later, in January 2006, the E<sup>2</sup>Brain Interest Group was founded. Its core task and responsibility is the joint development and marketing of RISC-based COMs designed around E<sup>2</sup>Brain. The specification can be downloaded at: [www.kontron.com/e2brain](http://www.kontron.com/e2brain)



*The standard board dimensions measure 115 mm x 75 mm or 4.5 x 3 inches for the RISC Computer-On-Module, or E<sup>2</sup>Brain module. The four connector locations, Pn1 (System), Pn2 (System Expansion), Pn3 (I/O) and Pn4 (I/O Expansion), were chosen for the high pin count they provide with little real estate, and their robustness and reliability. Pn1 and Pn4 have 140 pins and Pn2 and Pn3 have 80 pins for a total of 440 pins for the module.*

# The Case for Ready-Made Processor Modules

## High-end Digital Camera with RISC-COMs



*The Ikegami Editcam DNS-33W, the latest model, achieves real nonlinear acquisition and avoids a time-consuming digitizing procedure. Video clips can be accessed directly and edited by Avid nonlinear Editors such as Avid MC/NC Adrenaline, Xpress PRO and Xpress DV.*

*Selecting an appropriate processor module can save large amounts of development and test effort and allow a company to concentrate on using its expertise in a target market to add unique value.*

Peter Ahne



*Peter Ahne is Marketing Manager at Kontron*

[www.kontron.com](http://www.kontron.com)

When nonlinear disk-based recording first appeared in 1995, the choices for the embedded processor were limited and the application requirements were rather strict. This dictated an in-house design. Since that time, the application requirements are even tighter but the choices for embedded computing have increased dramatically. Today, an embedded 5.4 x 3-inch RISC Computer-On-Module (COM) board provides the computing power for many of the highlights shown after football games and other on-the-spot news clips. The transition provides a useful example to others who struggle with the „make versus buy“ decision for embedded computers.

Smart Acquisition Technology (SAT) integrates the process of capturing, logging and organizing clips and data for use in nonlinear systems. SAT is built around video and audio acquisition. Since SAT is digital, it provides high video quality with no generation loss and works with any industry-standard camera and editing system. In a

portable application, the design is rather tightly constrained from mechanical and power standpoints. Even today, there are not a lot of options in off-the-shelf boards that provide the required interfaces, are small enough and draw power low enough to meet the overall system requirements. To meet these requirements in the initial design, NLT Technology (NLT) designed the computing portion of the nonlinear digital recording system in house.

The initial design was used for many years and had a great deal of success but eventually outgrew the processing speed. For the second-generation design, a newer processor architecture, the PowerPC860, was used, but the board was still designed in house. For the third generation, the decision was made to look for a third-party solution rather than repeat the development process.

Realizing that NLT's value-added was not in processor design, the focus was placed on the unique video, audio and media management capabilities required in digital disk recording.

### That Was Then

For the next generation in disk recorders, the Editcam DNS-33W, a portable disk-based recorder (Figure 1) and the SAT2000 tabletop digital recorder, an outside supplier would be chosen to provide the digital processing power. Since the Editcam is an embedded portable camera that runs from batteries, lower power consumption was essential for longer use in the field. The same modules go into both the Editcam and the SAT2000, but the Editcam defined the space limitations. Additional key criteria in the selection process were requirements for supporting PCI, networks and core interfaces, which were basic requirements.

Originally, NLT selected the PowerPC RISC architecture because it was used in the previous design and was one of the initial RISC products in the E<sup>2</sup>Brain family. The Intel XScale processor, in Kontron's EB425 shown in Figure 2, provided an upgrade for increased processing capability with reduced power consumption. The transition did not require changing any of the NLT layout since the EB425 module had the same form-factor.

This was the initial appeal of the E<sup>2</sup>Brain approach—transitions could occur easily as new RISC products were developed within the standard form-factor. Physically, the two boards are plug-and-play. However,

there was software code that had to be ported from one to the other, but all E<sup>2</sup>Brain modules support VxWorks so the overall transition was rather straightforward. The upgrade allowed disk-based digital recorder improvements without investing additional time chasing state-of-the-art processing technology. When the initial disk-based recorder was developed in 1998, it took about a one and a half years of engineering time to develop the boards in house. Using the available embedded RISC board, the development time was reduced to about 6 months saving a considerable amount of time-to-market. NLT was a beta-site for the EB425, so integration of the board into the end product occurred concurrently with Kontron's development of the XScale version E<sup>2</sup>Brain module. The development time could have been even less if development started after the beta phase.

One of the major advantages of buying the board developed by a third party was the support of another engineering team working on both hardware and software designs. NLT's team did not have to focus on these issues because it came as part of the package. Part of the benefits of the E<sup>2</sup>Brain architecture was its status as a standard within

the Kontron family of products. The connector placement and board size were fixed and Kontron would be developing future modules using this same approach. The standards-based approach provides the scalability for future product enhancements and avoids starting from scratch every time a product upgrade is defined. Other advantages included not having to build and debug this portion of the system, and the warranty was handled by Kontron during production.

**A Standard Approach to Embedded RISC**

The whole point of using a RISC processor in many applications comes down to MIPS/watt and feature integration. In real-time recording, fast boot time is critical as well. RISC-based systems tend to boot faster due to smaller size of the boot code, compared to that of an embedded PC BIOS, and the use of lightweight RTOSs, such as VxWorks. Sometimes it can take as much as 30 seconds to boot a PC BIOS. The small footprint for the computing core in RISC processors allows integration of peripherals on the processor die without creating an excessively large chip that would increase the cost, footprint and po-



*The EB425 has a fixed board size and connector placement meeting Kontron's definition for an E<sup>2</sup>Brain standard RISC processing computer-on-module*

wer consumption. Reduced silicon area allows this integration, so an external chipset to get connectivity such as Ethernet capability is not required.

In the case of the NLT recorder, obtaining the level of performance (533 MHz) of an IXP425 processor from an x86-type CISC processor, the performance per clock cycle would have to approach an 800 MHz Pentium class processor and the CISC processor would dissipate from 15 to 20 watts instead of 2.8 watts. Even in the newer, more efficient desktop processors, power dissipation still approaches 10 watts.

**One form factor - many choices**

The table shows the versatility of the standard approach to embedded RISC processing. The two processors being compared operate at completely different speeds, have different external memory, and performance is drastically different: 106 Dhrystone 2.1 versus 1066. However, they both fit inside the E<sup>2</sup>Brain form-factor.

For NLT, the choice of a standard embedded module knocked a year off of the development cycle and advanced the introduction of the SAT2000.

The question arising is: How does a company know if its next product is appropriate for modules or a candidate for a full COTS or full custom board?

**The „Build Versus Buy“ Decision**

Questions that should be answered to determine “make versus buy” include:

1. Is the company's core competence in using rather than designing computers?
2. Can the design be completed before the market changes?
3. Can the advantages of today's computing performance be used before the next advancement in computing performance occurs?
4. What is the cost versus time trade-off of “do it yourself” versus “off the shelf”?

With advancements in technology and new approaches for standardizing embedded RISC modules, such as the E<sup>2</sup>Brain modules, a previously successful internal development does not provide sufficient reason to ignore the benefits of an off-the-shelf solution. If the incremental cost of buying a module can be absorbed, it gets a new design to market quicker, and avoids internal design efforts or external contract manufacturing. A standard module can be a lower cost alternative to doing all the engineering or subcontracting the full engineering design. Otherwise, the time-to-profit cost could ultimately limit the product's success.

*More information:*  
[www.kontron.com/pp11](http://www.kontron.com/pp11)

ONBOARD FEATURES	EB860	EB425
<b>PROCESSOR</b>	Freescale MPC 8860 @	Intel XScale IXP425 @
<b>80 MHz (OTHER MPC85x, 86x, ON REQUEST)</b>	266/533 MHz (other IXP 42x on request)	
<b>MEMORY</b>	64/128 MB SDRAM soldered	128 MB SDRAM soldered
<b>(UP TO 256 MB POSSIBLE)</b>	(up to 256 MB possible)	
<b>FLASH</b>	4/8 MB Flash soldered	4/8 MB Flash soldered
<b>(UP TO 32 MB POSSIBLE)</b>	(up to 256 MB possible)	
<b>SRAM</b>	1 MB buffered by auxiliary power (optional)	1 MB buffered by auxiliary power (optional)
<b>FIELDBUS</b>	CAN (optional)	CAN (optional)
<b>SRAM</b>	RTC, watchdog, CAM	RTC, watchdog
<b>MISCELLANEOUS</b>	(Ethernet address filter)	
<b>TEMPERATURE RANGE</b>	0C up to 70C	0C up to 70C
<b>-40C UP TO +85C (OPTIONAL)</b>	-40C up to +85C (optional)	
<b>POWER CONSUMPTION</b>	3W typ.	2.8W typ.
<b>PERFORMANCE DHRYSTONE 2.1</b>	106	1066 (CPU core + 3 NPEs)

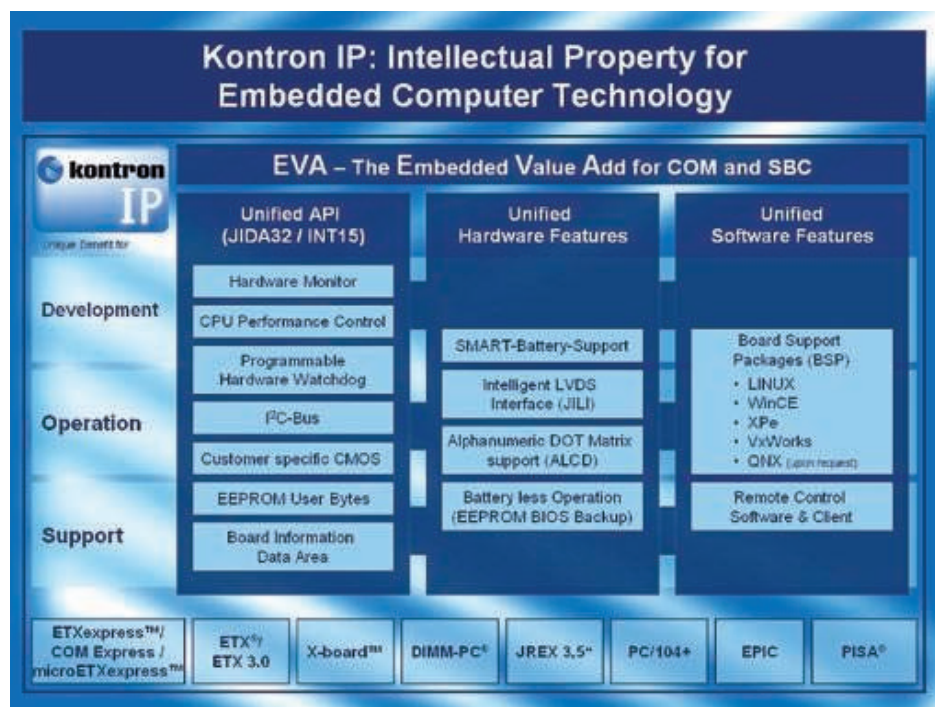
*The performance of a RISC board, the EB860 with an MPC 8860 compared to the same size standard board, an EB425, with an Xscale IXP425 processor*

# COM Management *made easy*

## *EVA: A single board handling standard for all COMs*

The new Kontron EVA (Embedded Value Add) program standardizes for the first time the Advanced Programming Interface (API), internal design, and management structure of Computer-On-Modules (COMs) and Single Board Computers (SBCs) in so far as they are not already defined by the form factor standard.

Josef Behammer



*EVA: The main features of COMs with standardized Embedded Value Adds*

For developers of embedded system applications, hardware handling is thus identical for all form factors and operating systems. The uniform management structure offers an identical look & feel and simplifies software development and porting of applications for all form factors. The benefits are numerous: greater efficiency, reduced development times, and shorter time to market. EVA is Kontron's first step as part of its 'Kontron IP' program.

To differentiate itself from its competitors, Kontron's IP program will integrate standardized

extended features and value-added services for different product ranges and vertical markets. By choosing this solution, OEM customers gain substantial competitive advantages.

Kontron's "Embedded Value Add" program (EVA) will be implemented immediately for the form factors ETX and ETX 3.0, ETXexpress / COM Express, micro-ETXexpress, X-board, DIMM-PC, JREx, 3.5", MOPS PC/104 and EPIC. For example, these features are fully supported by Kontron COM and SBC platforms built around the Intel Pentium M processor. Advanced board support packages (BSPs)

with the "Embedded Value Add" seal of approval are available for LINUX, Windows CE, Windows XP embedded, VxWorks (as license), and QNX (on request).

The new and comprehensive EVA feature set is ideal for the user. It not only guarantees a high and standardized level of board development for new customers, but also is a key element in customer retention.

Thus, along with the dedicated interfaces, standards, and certificates, it will become the most important decision-making criterion for developers.



Josef Behammer is Sales & Marketing Manager at Kontron Embedded Modules

[www.kontron.de](http://www.kontron.de)



### The specification components

Besides the uniform API (JIDA32 and INT 15), version 1.0 of the EVA specification offers in general every of these features a user could want within the scope of standardization of the feature set aside from the dedicated interfaces: Hardware monitoring and control, CPU management, thermal and (mobile) power management, CMOS access, display connection, GPIO addressing, and remote maintenance are all standardized and programmable via the uniform API.

### Overview of key features

Six Embedded Value Adds standardize the board handling beyond the form factor:

1. Standardized hardware monitor with temperature, voltage, and fan control including threshold value and hysteresis programming
2. Standardized CPU management by means of throttling and frequency control for customized variable control of CPU performance with separate software programming and in addition to ACPI control
3. Standardized hardware watchdog with NMI (nonmaskable interrupt) or reset functionality for executing precisely timed, dedicated functions  
Standardized smart battery support (SBS) including battery status query and intelligent charging control of multiple batteries in parallel for realizing mobile systems via ACPI
4. Standardized GPIO access via I2C bus with speed of up to 100 kHz. Standardized remote control features with JRC client integrated into the BIOS for editing BIOS, CMOS, and EEPROM as well as handling images via ISDN, modem, or Internet.
5. Standardized board information data area for tracking serial number, runtime, boot counter, and repair date for quality assurance  
Standardized TFT connection via JILI (intelligent LVDS interface) with EDID (Extended Display Identification Data) support

### What's IPs?

In the area of electronics development, IPs (*intellectual properties*) characterize solutions that are functional building blocks, i.e., unfinished products. They help customers implement their own solutions, simplify designs, and reduce the time to prototype.

6. Standardized service interface via ALCD for connecting an alphanumeric dot matrix display for the output of secondary information.

More information:  
[www.kontron.com/pp13](http://www.kontron.com/pp13)

# Process and Production Automation

More information: [www.praxis-profiline.de](http://www.praxis-profiline.de)

The second issue treats readers to a multifarious selection of current applications for FDT/DTM. What counts in the long-term use of the Field Device Tool and Device Type Manager for universal field device integration is economy. This is underscored by an economic analysis of the investment cycle for FDT/DTM and DD based asset management systems. Switching from the former island solutions to an open system brings decisive advantages. For many, the use of FDT/DTM amounts to a historical opportunity.



# Easy Graphic Adaption

*Whether it's a simple LVDS display adapter or a more complex CRT-to-LCD converter, the right flat panel controller for COMs is usually already available as an accessory.*

Daniel Piper

OEM customers no longer have time to deal with the technical details of the basic platforms: they want quick and efficient solutions and not just for finished industrial PCs in housings, but increasingly for Computer-On-Modules (COMs). For this reason, Kontron is always working on new functions and standardized features to minimize the time-to-prototype for COM users. One important example of this is graphics adapters for connecting industrial display technology. Besides the JILI interface (direct connection of panel to the baseboard), the use of a CRT-to-LCD flat panel controller is probably the most common requirement. The huge demand for solutions of this type often results from very specific visualization requirements in the industrial area. One of the latest products from this portfolio is the CRTtoLCD-7 flat panel controller



*Daniel Piper  
is Manager  
Distribution &  
Marketing for Flat  
Panel Solutions  
at Kontron*

[www.kontron.com](http://www.kontron.com)



from Kontron. The module offers conversion of image data according to flat panel type, extensive "image tuning" operations, including zooming, scaling, rotating, mirroring, and deinterlacing, under software control. This module has a "plug & display" connector for fast connection to the COM baseboard, for example via a VGA output (analog RGB). This variant of the flat panel control is also ideal for applications such as connecting a second display or implementing long-distance solutions with staggered LCDs. In addition, other interfaces and converters for DVI, PAL/NTSC/SECAM video, and YUV are on board, providing great flexibility in selection of the image source signal.

### Plug&Play connectivity

A programmable OSD can be used to control image parameters such as image position and brightness. at the push of a button. A large number of display cables and drivers are available for fast implementation of special displays.

Besides these flat panel controllers, Kontron also offers standardized graphics interfaces on its customized baseboards, or supports them directly on COMs and SBCs,

e.g. all ETX compliant COMs are equipped with a JILI-Interface.

The market potential for such solutions results from the fact that the "self-configuration" of monitors is usual in the commercial sector, thanks to the standardized VESA EDID (Enhanced Display Identification Data) process.

### EDID 1.3 support

However, this does not work in the area of embedded CPU boards, because with the graphics controller used, there is usually no or very limited software support from the manufacturer in implementation. CPU boards that support real plug & play connectivity for flat displays with EDID 1.3 are particularly convenient here. In this way, the display data can be managed independently of the board.

During connection to the assembly, the activation of the panel is completely automatic via the I2C protocol. Kontron COMs with EDID 1.3 implementation lead the LVDS signal required for direct TFT activation, which is specifically configured depending on the type of panel, via the JILI interface, for example. The JILI interface allows the activation of single and double port LVDS TFTs up to a 24 bit data width. Of course,

the connection of TTL displays which are still in use is also possible through conversion. Some 450 different display/board combinations are currently covered by JILI. Since new flat displays are regularly brought onto the market, Kontron also develops corresponding JILI display adapters as required.

*More information:  
[www.kontron.com/pp16](http://www.kontron.com/pp16)*

### FLAT PANEL CONTROLLER

The RoHS-compliant CRTtoLCD-7 flat panel controller from the aFLAT series will support the TV tuner expansion module as an option and is mechanically compatible with its leaded predecessors CRTtoLCD-2 and CRTtoLCD-3, which makes conversion particularly simple. Besides RGB and DVI input, the multimedia and TV CRTtoLCD-7 flat panel controller from the aFLAT series offers additional Composite and S-Video inputs for PAL/NTSC signals and comprehensive video source support (Component YPbPr), in which the simultaneous display of two signals in PiP mode (Picture-in-Picture) is possible. Therefore, it is well equipped for video sources such as cameras and DVD players. Joining this is also an integrated screensaver function, which prevents burn-in effects and so-called image sticking in TFTs. These can occur when the same screen contents are displayed for long periods of time. A very powerful script language enables individual customer requirements to be implemented in a comparatively short period of time without the need for modifying the board firmware or hardware. Additional benefits to Kontron customers include intense consultation prior to investment, long-term availability, and life cycle management that provides real-time information on current product updates and changes.

# Service for COMs

## Customer-specific solutions increasingly important

*COMs which are targeted to the customer-specific solutions market are no longer purchased exclusively as components. Customers are increasingly requesting total solutions, so that they can focus on their own core competences.*

Helmut Weber

Starter kits alone are no longer enough. Therefore, providers of COMs must increasingly also make the complete customer-specific design ready for production. This also gives providers the profile of a design house and contractor for customized solutions in the field of computer-on-modules. They – and this is an added value compared to pure development service providers – are implemented to the largest possible extent based on recognized standards like ETX (3.0), ETXexpress (COM Express), microETXexpress, or X-board and DIMM-PC.

### Building blocks for customer-specific solutions

The entire process, from design to serial production, also comes from a single source, and primarily prefabricated serial products are used in a virtual building block principle: Computer-On-Modules, cooling and memory solutions are already available as finished components, common interfaces and functions exist as prefabricated "building blocks".

### Quick implementation of customer requests

Thus, customized designs can be implemented extremely quickly for 80 per cent of customer requests, reducing the time to prototype to a minimum of a few days or weeks.

All around the Computer-On-Module portfolio, Kontron boards & MORE! offers a clever team that focuses exclusively on the implementation of the latest interface technology on baseboards

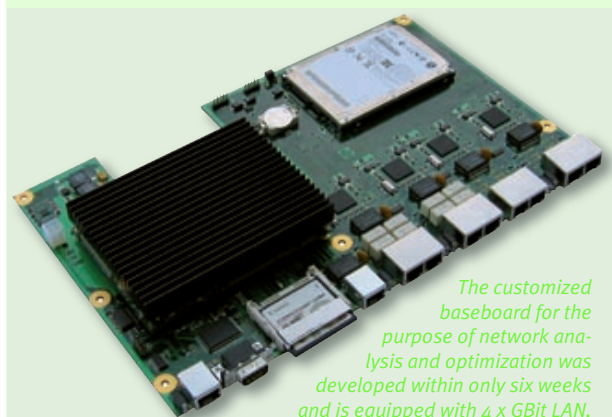
for COMs and the development of customized Single-Board Computers. Dozens of layouts are successfully implemented every year, and then manufactured in series.

By intensive consulting and optimized design, design risks

can be avoided in advance, and customized designs can be readied for production significantly faster.

More information:  
[www.kontron.com/pp12](http://www.kontron.com/pp12)

### FAST, FASTER, COMS



*The customized baseboard for the purpose of network analysis and optimization was developed within only six weeks and is equipped with 4 x GBit LAN, among other things.*

Customized COM baseboards can be finished in just 35 to 40 workdays from the awarding of the contract. That is extremely fast: many providers advertise 30 days from final determination of the specifications. However, the final specification is often changed during the development phase to retroactively optimize functions, drop them, or add them. This can also happen during the circuit diagram development or the layout phase. With the competition, the 30 day clock then resets. At Kontron, only the fine-tuning of the final circuit

paths takes place. The last two weeks are for assembly.

### INTERESTING FEATURE SET

The customized baseboard that Kontron developed for the purpose of network analysis and optimization for a leading test and measurement provider in just 6 weeks is equipped with 4 x Gb LAN, among other things. In operating mode, the board provides network data for analysis and optimization to the ETXexpress Computer-On-Module. Without voltage the two Gb Ethernet signals are merely passed through (2x in/2x out).



Helmut Weber is project manager with Kontron for customer-specific baseboard projects, based on COMs

[www.kontron.com](http://www.kontron.com)

# Power supply via „copy & paste“

## MARS: Modular energy management development platform for mobile COM applications

Kontron facilitates the development and implementation of efficient power supplies for mobile applications with the new MARS (Mobile Application platform for Rechargeable Systems) modular development platform.

Christoph Stark



The evaluation board for MARS integrates the four reference designs SMART Battery System, Input Buck Boost Converter, Dual Buck Converter and Buck Boost Converter. Their layout files can be integrated into the custom baseboard layout simply by “copy & paste”

MARS is an optimized reference design for ETX, ETXexpress (COM Express-compliant), and microETXexpress solutions and is easily transferable into customer-specific designs. Apart from management interfaces for smart batteries, helpful power features such as extended input voltage ranges (i.e. industrial voltage ranges or voltage for in-vehicle PCs), connection possibilities for all ATX voltages, and backup battery support for battery replacement during operation are offered by the modular reference design. In a first step, MARS will be available as a complete evaluation board for Kontron’s ETX-PM with an Intel Pentium M processor in connection with the ETX-eval starter kit in January 2007. Additional board support packages for COMs from Kontron will follow in February 2007. The MARS

reference design is supplied as an evaluation board including IP (Intellectual Property) that is ready to use out of the box. Kontron makes the MARS design layout and switching data available in ORCAD format. Simply copy and paste into the custom baseboard layout. Customers thereby profit from an extremely short time to prototype.

### Management of two smart batteries

MARS manages up to 2 smart batteries. Depending on the application, the smart batteries can be operated with or without the support of the operating system. Extended energy management can be programmed via the standard SM bus accesses.

Via the Kontron MARS platform, important data such as state of

charge and temperature for the smart batteries, current MARS states, and much more information can be analyzed for energy management. An evaluation board for the connection of 2 smart batteries, a manual including functional descriptions, and 1 SM bus and 2 ATX power cables are included in every Kontron MARS package.

### Kontron MARS Reference Designs:

- ▶ The smart battery system manages the charging and discharging processes of up to 2 smart batteries in parallel (ca. 10 per cent more yield) or serial operation.
- ▶ Transfer of the SBS state data, e.g., state of charge and temperature, is done via an



Dr.-Ing. Christoph Stark works as a Hardware developer at Kontron

[www.kontron.com](http://www.kontron.com)

SMBus on ETX, ETXexpress and microETXexpress baseboards.

- ▶ The input buck-boost converter extends the input voltage range to 5-28 V and enables power supply with an ATX power supply unit or DC voltage.
- ▶ An ATX-compliant power supply is available, through a dual buck converter, for ETX, ETXexpress and microETXexpress COMs. It supplies voltages of 5 V, 5 V\_STB, and 12 V as well as connection options for - 5 V and - 12 V or + 3.3 V via a DC/DC switching controller.
- ▶ The buck-boost converter increases the battery output

voltage if a backup battery with  $V_{min} < 12 V$  is used.

### Battery efficiency with mobile systems

With mobile applications the battery management has a great influence on battery life and efficiency. Along with the careful selection of the optimal battery type further aspects of battery management should be considered:

- ▶ Power supply and charging connection should ideally be laid out so that even with the CPU working at full capacity, there is enough power for charging. A power input limiter (e.g., on maximum power requirement CPU module + 25 per cent)

does reduce the power input of the entire system, but can impair the charging and, in the long run, with NiCd batteries can lead to shortening of battery life, since with high CPU load not enough charging current is available.

- ▶ Charging should be exactly attuned to the battery type used, to ensure that the batteries are treated in such a manner that service life is as long as possible. For this, it should be possible to correspondingly determine the charging and discharging conditions via the application/program and, if applicable, with Smart Battery Systems to carry out a calibration of the battery electronics along with a corresponding discharge.

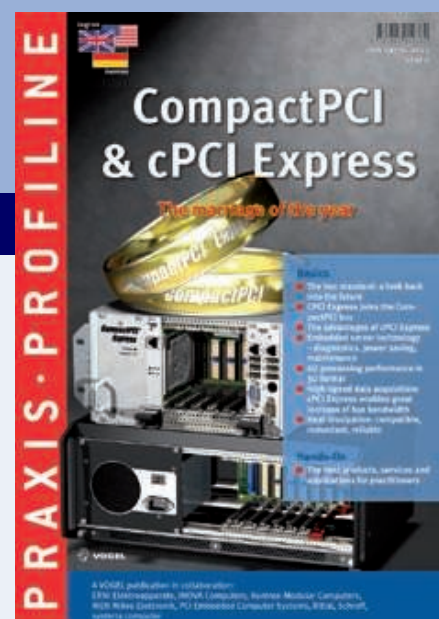
- ▶ In mobile applications or those not connected to the power grid, the use of two batteries is often desirable. Thus, in ongoing operation one or two batteries can be replaced one after the other. Beyond that, the parallel discharging mode is recommended, since in the case of parallel use of the batteries the life is extended by up to 10 per cent, as compared to sequential use (due to optimal chemical discharging processes in the battery). From an ecological and economic perspective this is clearly the better choice, even if the procurement costs are initially higher.

More information:  
[www.kontron.com/pp14](http://www.kontron.com/pp14)

# CompactPCI & cPCI Express: The marriage of the year

More information: [www.praxis-profiline.de](http://www.praxis-profiline.de)

Ten years after being born, the CompactPCI-Bus is about to be joined by its successor CompactPCI-Express. The serial future has begun: the transfer rate has now gone up to four Gigabytes per second, while "hybrid" slots mean that 32-bit cPCI peripheral cards can continue to be used without problem. This safeguards previous investments in the cPCI standard and enables it to be combined with the advantages of the serial PCI-Express bus. Why does the new generation of systems need new connectors that are compatible with the rapid PCI-Express signals? How has the PICMG-managed Compact-PCI Standard 2.0 (currently 2.2) developed? All is revealed in PRAXIS PROFILINE with the help of practical examples.



# The borrowed eye

## Wearable PC with Kontron ETX COM used around the world in mobile service

The size of a first generation Walkman, the i-boro PC, which can be worn on a belt, is integrated into a novel communications system for service and maintenance work on devices, machines, and facilities. The system is based on ETX Computer-On-Modules (COM) from Kontron and was developed by ies Industrie-Elektronik Schmitz in cooperation with SN Technics.

Gerhard Steger & Zeljko Loncaric



Dr.-Ing. **Gerhard Steger** is CEO of Industrie-Elektronik Schmitz GmbH & Co. KG, Kierspe

[www.ies-gmbh.de](http://www.ies-gmbh.de)



**Zeljko Loncaric** is Product Marketing Manager Embedded Modules, Kontron

[www.kontron.com](http://www.kontron.com)



The i-boro (pronounced "eye borrow") PC can be worn on a belt, but it can also be described as a "borrowed eye on site": with a unique VCD headset (Voice Camera Display) for bi-directional IP communication, distance is no longer a factor. Time and costs in on-site after-sales service and maintenance are significantly reduced. OEMs provide these WLAN, UMTS, and satellite-capable systems with the documentation for the device, machine, or facility. Employees of the end user or local machine service staff can carry out the first diagnostic steps in repair work and regular maintenance. With support from an OEM central service center employee, even difficult tasks can be solved with remote support. Depending on the OEM's service concept, maintenance documents, animated quick reference guides for standard maintenance, or even avatars can be used off-line on the wearable PC in

order to reduce costs for the end user and time for the central OEM service employee to a minimum. Maintenance and repair tasks are delegated as far "down" as possible.

The vision even goes beyond today's technology: in the long term, virtual reality image recognition-based UIs will perfect solutions like the i-boro. The appropriate software is being developed by many suppliers. RFID tags will support this path with decentralized intelligence. But right now, the extremely small autofocus zoom camera and the powerful and – thanks to smart battery sup-



*With after-sales service and maintenance time and costs for on-site service can remarkably be reduced.*

port – battery-saving wearable PC represents a crucial milestone for this technology, which will lead to market penetration. Up to now, problems such as manual focusing of the lens, relatively limited resolution rates in image transmission, and a lack of zoom function were as much of a stumbling block to extensive market penetration as processor performance with appropriately low energy use at attractive prices. With the new i-boro system from SN Technics, this obstacle has now been overcome. The camera focuses automatically and provides brilliant image data, zoomed as needed, in VGA or SVGA resolutions. Camera zoom functions are controlled via a keypad integrated into the i-boro. Interfaces for WLAN, UMTS, or satellite are available as communication interfaces for the IP-based communication of images, video, and audio data.

The first users and interested parties in the fields of

- ▶ Machine and facilities construction
- ▶ Auto manufacture and supply
- ▶ Pharmaceutical and chemical manufacture

- ▶ Printing industry and publishing
- ▶ Energy
- ▶ Shipbuilding and ship owners
- ▶ Household appliance manufacture
- ▶ Aircraft maintenance
- ▶ Defense, etc.

can expect savings of several million dollars thanks to the i-boro, because current practice requires service technicians to be called to the site to determine in the shortest possible time what replacement parts are needed. Depending on the location, it may be necessary to wait one or two days for the replacement before it can be installed to bring the machine back into operation. This quickly leads to avoidable costs of a few thousand dollars per service technician-year. However, these costs alone are not crucial: much more important for end-users is reducing downtime to a minimum, since production grinds to a halt when the machines are not working. Depending on the product, immense margins can be lost.

#### Technical highlight: thermal design, the smallest box and smart battery support

The developers have come up with something special in the housing design for cooling the powerful

Intel Pentium M processor. While in principle, cooling a 1.1 GHz Pentium M is no problem, at the system dimensions of a mere 230x140x44 mm, this is usually done through passive thermal coupling to the housing. However, this method is undesirable in a wearable system, because the housing would reach 50 degrees Celsius, which would be uncomfortably warm on the body. For this reason, a solution had to be developed that did not couple the thermal design to the housing, yet is robust enough to withstand long-term mobile use. The solution is based on an integrated passive heatpipe that is insulated from the housing; at the internal end, the turbulence of the waste heat is ensured via a microfan, meeting the highest MTBF requirements. More details are proprietary, because the unique design promises SN Technics a competitive advantage and even more design wins in the field of mobile computing.

Furthermore, smart battery support is an important criterion for mobile applications, because ideally the operating period of the battery should cover a full working day. This is possible, but is currently impractical because the batteries needed to run the application continuously for eight hours are still too heavy. For this reason, the system has a buffer battery so the batteries can be exchanged while in operation. The system runs for 10 minutes without a battery and then shuts down automatically and error-free if there is no power supply. Depending on the operating mode, the system automatically switches its resources on and off in order to save energy, which is always in short supply in mobile applications. In day-to-day operation, one battery is currently sufficient for 4 hours. The second battery can be carried in a belt pouch with a Velcro fastener. The energy management

*The industrial-grade i-boro is based on an ETX-PM module with 1.1 GHz Intel Pentium M processor and features all the standard interfaces necessary in industry (USB2.0, Firewire, PCMCIA). The cooling is based on an integrated passive heatpipe that is insulated from the housing; at the internal end, the turbulence of the waste heat is ensured via a microfan.*



functions were developed together by SN Technics, ies, and Kontron and will soon be available through the three companies, so that developers of these functions will hardly have to put in any effort on them, because they will be part of the board support package.

#### COMs reduce the pressure for electronics developers

The PC system design with Intel Pentium M 1.1 GHz processor (optionally 1.8 GHz) and up to 1024 MB RAM is based on Computer-On-Modules (COM). The form factor of a COM determines the format for the fully-fledged PC. In practice, the dimensions are 95 mm x 114 mm. The use of COMs allows users to employ proven systems with higher functionality as building blocks, and concentrate fully on their core competence. COMs simplify product maintenance by reducing the parts list from several hundred individual components to just one element. Cancellations of nonessential components do not require additional redesigns on the computer module, because Kontron guarantees a minimum five years form-fit function on its COMs. With a shorter time-to-market, a lower design risk, always the most up-to-date computer technology and no additional expenses for hardware and software maintenance, more and more manufacturers of devices and systems are using these advantages for a wide variety of applications and industries, because the outsourcing advantage is unmistakable with COMs.

Another advantage of using COMs for SN Technics is the ability to adapt the base circuit board

easily to any new requirements without having to commission a completely new board design. Thus, necessary new developments can be adapted to the latest requirements with the least expense.

"Thanks to ETX, smart battery support, and the powerful, energy-saving Intel Pentium M processor, it was possible to adapt the PC technologies of the new i-boro to all important market requirements", says development manager Jörg Seitz from the manufacturer SN Technics. The first pilot projects with Bosch, Daimler-Chrysler, DMG, and Miele confirm this prognosis.

#### i-boro from SN Technics at a glance

- ▶ The industrial-grade i-boro is based on an ETX-PM module with 1.1 GHz Intel Pentium M processor and features all the standard interfaces necessary in industry (USB2.0, Firewire, PCMCIA).
- ▶ The headset for sound, zoom camera, and eye-monitor weighs a mere 770 grams.
- ▶ The controls for the screen menu and camera are integrated into the i-boro via a 2-button mouse and 4 button keypad.
- ▶ WLAN, UMTS, and satellite are supported as interfaces to the central technician.

More information:  
[www.kontron.com/pp17](http://www.kontron.com/pp17)



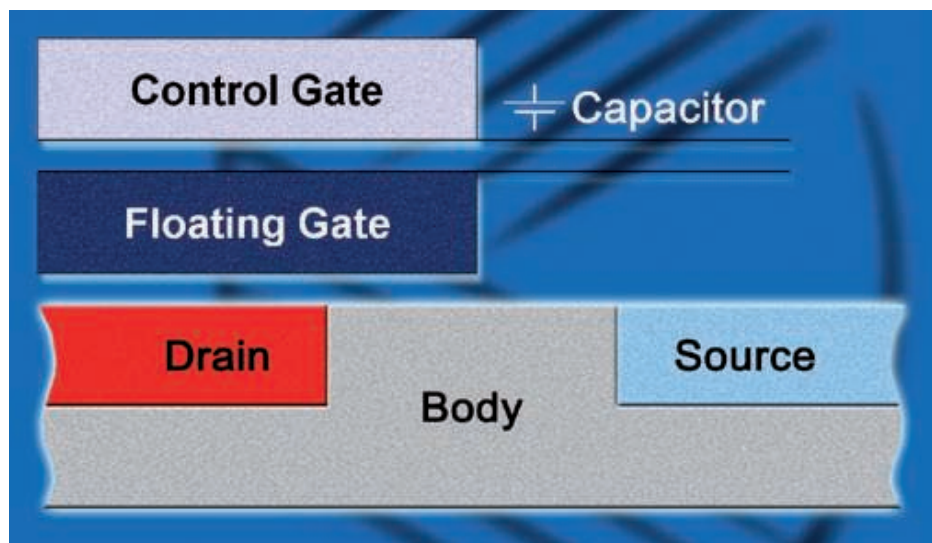
The second battery is carried in a belt pouch

# Flash as Hard Drive

*Robust but only long-lived when the right technology is used*

Embedded applications increasingly call for the implementation of systems without moving parts. However, with hard drives there is a limit, since no solid-state memory medium yet exists that can rival the capacities available with a moving magnetic drive.

Claus Giebert



*Floating Gates: Practically all of today's non-volatile memory technologies are based on so-called "Floating Gates"*

Currently, this means that one is almost always limited to Flash memory. Certain rules apply to its use.

## Physical background

Practically all non-volatile memory technologies today are based on so-called "floating gates" (FG).

Although the setup varies, in principle it is implemented as shown in fig. 1 (Abb1.) The reactions of the actual transistor (consisting of drain/source/floating gate) are determined by the voltage between FG and source. This voltage depends on the charge of the "disk" capacitor (consisting of control gate (CG) and FG as well as the potential of the CG. This can be used to read the state of the memory location by selecting a suitable voltage on the CG.

This procedure does not damage the memory location and aging only occurs due to leakage currents which cannot be completely avo-

ided. After a certain amount of time (data retention time of more than 10 years) these leakage currents cause the memory to fail.

However, there is the question of how to store data since the FG is totally isolated from the environment and of how much this procedure affects the memory locations. Regardless of any evaluation of which model (Channel hot electrons, CHISEL, etc.) can be used for the explanation, the procedure is based on the application of a voltage which is clearly above the read-access voltage. The field strengths created by this are above those which occur when lightning directly strikes the insulation of low-voltage cables, for instance. It is clear that this procedure represents a great strain on the insulation layer. This is also one of the reasons why data retention is no longer guaranteed after a certain number of write cycles. The isolator

is simply so "full of holes" that the charge drains off too quickly. Since all non-volatile, semi-conductor memories (except FRAM) work the same way or very similarly, it is impossible to produce a memory which can be write-accessed an infinite number of times. This must always be considered when Flash is used as a substitute for HDD. This means that all maintenance concepts must also always include purchasing substitutes.

## Read or Read & Write

When Flash is used in read-only mode, damaging effects are not to be expected since read-accessing the memory produces no stress to speak of. Since no read heads have to be positioned, the system is sometimes even accelerated depending on the type of access being used. However, when Flash is used in read and write mode, each write



Claus Giebert  
is Product  
Manager at  
Kontron

[www.kontron.de](http://www.kontron.de)



access can cause the same sectors (for instance the file access table, FAT) to be deleted or overwritten more frequently than others. This causes the memory to age. Take the logging of CAN telegrams as an example in practice: If data are backed up on mass storage once per second, that adds up to 2,592,000 times per month. If the Flash manufacturer specifies a million write accesses, this means that memory failure can be expected in less than a month. Another example is the recording of system status with Log Files once per minute. If the same Flash memory is used, expected life time is approximately two years.

#### Load distribution

One way to handle this problem is to distribute the accesses to all unused sectors. This can be accomplished in two ways. If, on the one hand, the next free sector is always written in the Flash memory (e.g.

Compact Flash) and if Flash operating software makes it appear as if the data are always contained in the same sector, such a life-extending solution can be used by any system which can access mass storage at all. The second life-extending measure can be implemented via the related file system. In addition to the particularly unsuitable FAT, file systems also exist such as NTFS or also extensions which are designed especially for MOD or Flash use. The disadvantage of this solution is the dependency on the operating system. In addition, it must be remembered that only free sectors can be used. This means that the fuller the memory, the fewer the sectors over which the write accesses can be distributed.

#### Masking

Today's Flash memories offer great capacity, but frequently have blocks which do not function

correctly. To be able to use these blocks anyway, manufacturers of memory drives have borrowed from solutions for hard drive technology. This technology has always marked defective blocks as such and then replaced them with correctly functioning blocks from the periphery. Tracks are even reserved especially for defect handling. Transferring this concept to Flash technology, a capacity is specified which is theoretically less than the blocks can actually deliver. On the one hand, this reserve is used to mask sectors which will never function correctly at all. On the other hand, it can also be used for later masking and replacement of areas which were destroyed by frequent deletions.



Flash drives can almost compete with hard drives

By combining all your options it is possible to create a Flash drive that can almost compete with hard drives. Despite all this, however, you still have to continuously keep the type of accesses in mind since no solution exists that permits write accesses in the millisecond range, for instance. It is also a good idea to use an OS which permits the prediction of which accesses will use mass storage. Windows XP embedded, Windows CE or LINUX are good choices.

More Information:  
[www.kontron.com/pp15](http://www.kontron.com/pp15)

# New Standard for 19" Technology

More information: [www.praxis-profiline.de](http://www.praxis-profiline.de)

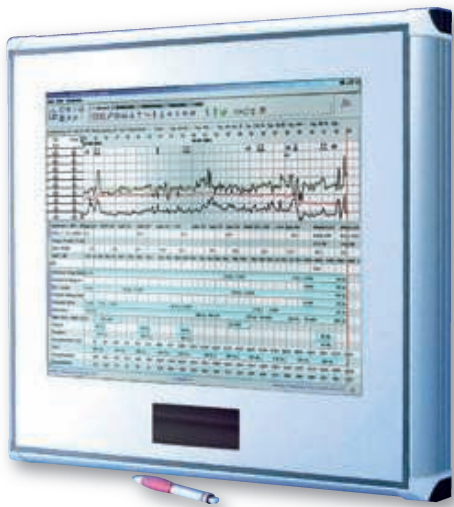
Demand for flexible and reliable infrastructures is growing on account of the increasing data traffic in information technology. MicroTCA architecture, only adopted in mid-2006 as the MTCA.0 specification, is creating the link between telecommunications and industrial automation. Given its small form factor and scalable architecture boasting high functional density and fast transmission rates on the backplane, MicroTCA is a very open standard which meets the high demands on modern-day and future systems and services. This offshoot of the AdvancedTCA specification and sister to the AdvancedMC specification for mezzanine boards offers an excellent basis for flexible, upgradeable, low-cost controller platforms with the high availability and remote maintenance in such demand in the industry. The knowledge base as it stands, practical solutions and initial applications are featured in this edition of PRAXIS PROFILINE published in conjunction with leading partners in industry.



# COMs @ work

*The third generation is now in use*

## Performance-Upgrades for Clinical Workstations



*Clinical workstation: an excellent example of the scalability that can be achieved by designing with COMs*

In 2001, Fresenius MC Medizintechnik began development of a clinical workstation that is used today as the anesthesia documentation system in the operating room and as PDMS (Patient Data Management System) by intensive care units. Using appropriate interfaces, the workstation monitors and controls medical devices such as cardiovascular system monitors, respirators, infusion technology, and so on. Patient data is collected, displayed, archived and placed on the hospital's IT network.

Important features that were implemented for the extremely flat (85 mm) 19" Touchscreen PC with optional PCI expansion interface include fanless (noiseless) operation, optional Flashdisk operation for non-stationary locations, IP65 protection rating as well as compliance with all medical safety and performance standards (EN60601-

1-1, EN60601-1-2, EN60601-1-4) for certification as a medical device as per MPG (medical product law). A third performance upgrade of the design has now been executed without the need to change the baseboard. The original models are still using an Intel Pentium III processor running at 500 MHz. Later models followed with a Pentium III processor running at 700 MHz and a 933 MHz Pentium III Mobile processor; the latest is an ETX module with a 1.1 GHz Pentium M processor. Additional performance upgrades up to and including the Intel Core Duo are available as required. This application is an excellent example of the scalability that can be achieved by designing with COMs. This in turn also can reduce development costs over the long run and thus the customer's total cost of ownership (TCO).

[www.kontron.com/app01](http://www.kontron.com/app01)

## Infotainment with Robust IPC Core

Where Infotainment perfection on the POS/POI is concerned, PC technology is the only platform which can unite all potential media. Display-based solutions with separate PC hardware are not flexible enough and require additional cabling and lots of space.

That is why friendlyway has equipped their d-sign infotainment monitors with the latest PC functionality including touchscreens. Thanks to COMs, scaling the systems – which feature up to 40-inch screen diagonals – to customer requirements is easy and inexpensive.

The very flat (depths of 5 cm to 10 cm) models of the PC systems that are designed for long-term availability place high demands on the hardware: high CPU and graphics performance, numerous interfaces

For easy connection of I/O devices such as camera, microphone, external keyboard, WLAN, card reader, proximity sensors or even door openers had to be implemented in a minimum of space simultaneously with low heat generation.

Solutions based on ETX modules are now being used. They permit low-profile designs and reliable cooling as well as the latest in processor performance that is needed for POS/POI-systems.

[www.kontron.com/app02](http://www.kontron.com/app02)



*Flexible POS/POI systems with ETX*

## Prepaid Cards and Tickets from the Electronic Store

With its new vending machine concept - the e-Loading machine - tobaccoland has opened the market for the automated sale of digitized goods and "virtual rights." In addition to applications such as re-charging prepaid cards, products will be added that can provide cell phone ringtones, tickets for soccer games, or local transportation services. Tickets for admission or for

transportation fares will be output on an integrated printer on security paper. Each system is wirelessly connected with a central computer via a radio modem.

This connection is used by tobaccoland to replenish electronic goods, make software updates, monitor system status and perform maintenance on the vending machines. The demands on the

computer hardware are immense: it must be robust enough for outdoor use, including extreme temperatures; round-the-clock reliability is vital; and performance must be sufficient (despite a fanless design) to make the graphic user interface user-friendly and flexible. The hardware must also permit advertising films to be shown as needed.

Additionally, the machines, which feature a vandal-proof, 10.4-inch screen, can offer several products at the same time.

The machines may also be reprogrammed quickly for a new products mix. For the span of its intended 10-year lifetime, the system also must be adaptable to technological developments (for instance advances in processor technology).

An ETX-based design meets these requirements and offers uniform service and easy upgrades by replacing the CPU modules without any modifications to the vending machines at all.

[www.kontron.com/app03](http://www.kontron.com/app03)



*Demands on the computer hardware are immense: vending machines with an ETX-based design meets these requirements*

## The Specialists on Board

ETX standard COMs are also used in highly-specialized embedded applications such as medical devices. Medical technology provider SCHILLER offers a mobile patient monitoring system based on ETX modules that can be used for the transmission of patient data via UMTS.

For the first time, UMTS technology offers rescue squads digital data communication options with the performance that they require. The "ARGUS PRO" intensive care monitoring system for emergency patients combines all of the data from the patient monitoring system and can display it both on the monitor screen on site and, via UMTS, in real-time anywhere in the world. The system is particularly useful in providing wide-band, mobile telemetry data transmission from rescue helicopters

and ambulances moving patients to special clinics; the specialist at the receiving clinic can observe events with a "watchful remote eye."

The current solution prepares a diagnostic-quality, resting electrocardiogram with automatic interpretation and faxes this resting electrocardiogram from the monitoring application to a defined target hospital for diagnosis (second opinion) or to a web server which authorized persons can access with two-factor authentication from a web browser anywhere in the world.

Since only the raw electrocardiogram data and the vital signs data are sent, the web server offers the user special software that enables unrestricted evaluation. This means that a remote application with the individual vital signs (for instance the 12-channel electrocardio-



*For the first time the ARGUS PRO mobile patient monitoring system offers UMTS support for the transmission of patient data*

gram) is already available today. Remote monitoring of all vital signs, including live-video-stream sequen-

ces, is possible with UMTS with the full configuration (2 Mbit/sec).

[www.kontron.com/app04](http://www.kontron.com/app04)

## Keep on the Track with RISC

An individually developed CPU module with 80 MHz Freescale MPC855T controls the analog and digital ORTHOPHOS X-ray systems from Sirona Dental Systems GmbH.

The module is the intelligence center of the high-end systems developed by the dental technology company.

It controls the circular path of the camera ring, ensures precise exposure times, regulates the X-ray strength and processes the image data for the digital systems. The COM at the core of this system is equipped with 32 MB of Flash and

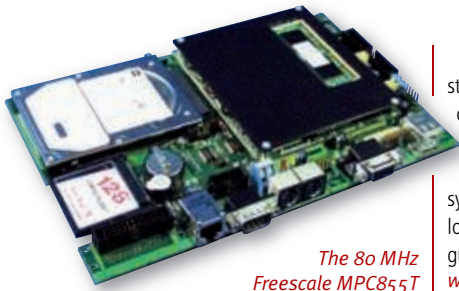
128 MB of SDRAM. A real-time clock and a Flash bootloader are also integrated. In addition to the computer core, a dedicated communications processor ensures swift data throughput.

This inexpensive, specialized processor, which is actually designed for diverse data communication tasks, can easily handle the enormous flood of data (several hundred Megabytes) produced by a jaw scan within a half a second.

The baseboard with its X-ray device-specific elements was developed by Sirona itself. ▶



*COM with RISC processors controls dental X-ray machines from Sirona*



The 80 MHz  
Freescale MPC855T

► The E<sup>2</sup>Brain series which stands for RISC-based COMs is a concrete result of this project and similar developments. The very first COM Standard for RISC systems was created with the disclosure in May 2005 of the design guidelines of the E<sup>2</sup>Brain modules. [www.kontron.com/app05](http://www.kontron.com/app05)

## Survival of 30 Years under Extreme Conditions



The AGC (Autorail Grande Capacité) from Bombardier is part of the latest generation of regional trains for local and long-distance travel.

The graphical user interface (GUI) for the train management system to control the core functions of the train and monitor and manage the passenger-oriented comfort area is based on an E<sup>2</sup>Brain module with 330 MHz Freescale Power PC MPC8245.

E<sup>2</sup>Brain COMs with RISC processors are ideally suited to meet the extreme demands of the EN50155 standard for electronic train applications. This standard states that the components must function fail-safe 24 hours a day, over a period of 30

years (about 250,000 hours), must be designed for the most rugged climatic conditions, must be able to handle great temperature fluctuations (-40°C to +85°C), moisture, vibration and voltage fluctuations and must be passively cooled.

The GUI is integrated via Ethernet in the train network. In addition to the Fast Ethernet connection, the Bombardier E<sup>2</sup>Brain module, EB8245, also offers all the features and interfaces needed for real-time applications such as those on trains as well as in industrial applications: four serial interfaces, one CAN interface, 32-bit 33/66 MHz PCI bus; and LPC bus.

All interfaces are designed for the four standardized SMD plug connectors on the baseboard. Up to 512 MB of SDRAM, up to 32 MB of soldered Flash (133 MHz, 64 bits), 1 MByte of buffered SRAM and 64 kbit of EEPROM are available for handling of user and configuration data. [www.kontron.com/app06](http://www.kontron.com/app06)



E<sup>2</sup>Brain-COM for train management system at Bombardier

## It pays to participate

### Win a mobile smart battery management development system



Win one of 20 Kontron MARS starter kits

Kontron is giving away 20 MARS starter kits worth a total of 4,000 euros (approx. \$5,275).

The modular development platform MARS (Mobile Application platform for Rechargeable Systems) facilitates the development and implementation of efficient power supplies for mobile applications. MARS is an optimized reference design for ETX, ETXexpress (COM Express-compliant), and microETXexpress solutions and is easily transferable into customer-specific designs.

Apart from management interfaces for smart batteries, helpful power features such as extended input voltage ranges (i.e. industrial voltage ranges or voltage for in-vehicle PCs), connection possibilities for all ATX voltages, and backup battery support for battery replacement

during operation are offered by the modular reference design. The MARS reference design is supplied as an evaluation board including IP (Intellectual Property) that is ready to use out of the box. Kontron makes the MARS design layout and switching data available in ORCAD format. Simply copy and paste into the custom baseboard layout. Customers thereby profit from an extremely short time to prototype.

The entry deadline for the MARS lottery is March 15, 2007. The winner will be notified by us in writing. The judges' decision is final.

To download the entry form, go to <http://www.elektronipraxis.de/aktionen>

**Good luck!**

# Latest COMs

*New products shown at Embedded World 2007*

## X-board <GP8> starter-kit



The X-board <GP8> starter kit

The RoHS-compliant X-board <PXA> miniKit is an efficient evaluation kit for ultra-compact and robust mobile applications based on the open Computer-on-Module (COM) Standard X-board®. Windows CE is preinstalled. The application can immediately be tested on the new target system, even if the customer-specific baseboard is not ready yet. Along with the miniBaseboard and 3.5" QVGA touchscreen display, another component of the Kontron miniKit is the high-performance X-board<GP8> module in sub-check card format (68 x 49 mm). It offers the highly integrated Intel XScale 80219

general purpose PCI processor with 400 MHz or 600 MHz performance and up to 128 MB DRAM on-board and up to 32 MB flash on-board. Additionally, the new COM module features the AC97 Audio CODEC, 8 MB of on-board graphics memory, CRT and LCD TFT display support providing outstanding graphics and video capabilities with resolutions up to 1280 x 1024 pixels and all of the interfaces needed for mobile multimedia devices. 10/100 Base-T Ethernet, USB 2.0 and the other standard interfaces included in the X-board module design complete the extensive feature set.

[www.kontron.com/appo7](http://www.kontron.com/appo7)

## DIMM-PC for ever

The DIMM-PC product family, originally introduced in 1998, gets a revival at Embedded World 2007. The first DIMM-PC/386, which is

still available, bundles a 386-class CPU, all of the typical peripheral components, watchdog timer, PWM generator for motor control, FailSafe

mechanism, and JTAG interface on a mere 68 x 40 mm (2.7 x 1.6 in). The DIMM-PC/386 has a clock speed of 40 MHz, a power supply of 5 V in accordance with the DIMM-PC specifications, and a power consumption of just 1.5 W. With up to 2 MB of DRAM and 16 MB of IDE flash, it provides sufficient memory and performance for embedded systems. In addition to Ethernet, two serial interfaces, and one parallel interface, the CPU is equipped with an I<sup>2</sup>C bus for quick and easy connection of peripherals such as temperature sensors or digital level gauges. Additional peripheral

devices can be connected either via customer-specific baseboard functionalities or via DIMM-PC expansion modules. Kontron offers DIMM-PC modules for graphics and Bluetooth. [www.kontron.com/appo8](http://www.kontron.com/appo8)



68 x 40 mm:  
the DIMM-PC/386

## Extremely compact baseboard or ETX 3.0



All you need on a mere  
130 x 155 mm

At 130 mm x 155 mm, the new, RoHS-compliant ETX miniBaseboard is barely larger than the ETX module (95 x 125 mm) itself.

As a result, it can be integrated as an extremely compact baseboard in almost any embedded application, easily and simply.

The integrated communication interfaces are: 1x 32 bit PCMCIA slot, 4x USB, 1x 32 bit PCI slot, 4 serial interfaces, and 2x Ethernet interfaces with 10/100/1000 or 10/100 Mb. Moreover, storage media can con-

nect to ETX 3.0-compliant ETX modules via 2 onboard SATA interfaces. Furthermore, one CF card slot and two IDE interfaces also are offered. Flat panels are controlled via a standardized LVDS interface.

Additional graphics may be connected through a VGA output (SUB-D). 1x LPT (SUB-D), 2x PS/2, and stereo audio I/O via a 3.5 mm plug complete the feature set.

[www.kontron.com/appo9](http://www.kontron.com/appo9)

## Certificated quality for COMs



UL certification eases export of COM based applications

The implementation of UL certification for Computer-On-Modules (COMs) provides OEMs with significantly more security in the selection of appropriate COMs and considerably simplifying the procedure for its own UL certification.

The UL certificate (UL 60950-1:2003 First Edition and CSA C22.2 No. 60950-1-03 First Edition from April 1, 2003) was obtained in a large-scale validation process for all COMs with the ETX and ETX 3.0, ETXexpress/COM Express, microETXexpress, DIMM-PC, and X-board standards. According to research carried out by the company, Kontron is the first provider to

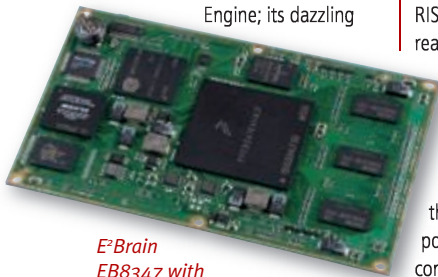
UL-certify its COMs. All products with UL certificates for "Information Technology Equipment Including Electrical Business Equipment" can be researched centrally at [www.ul.com](http://www.ul.com) (file name: NWGQ2.E304278 for the US and NWGQ8.E304278 for Canada).

UL certification of COM products is especially attractive for OEMs offering solutions in Canada and the US because, apart from the EN60950 certificate that Kontron has long held, the UL certificate is the absolute seal of quality for these countries and is mandatory for systems that are intended to be shipped and sold overseas.

[www.kontron.com/app10](http://www.kontron.com/app10)

## RISC-COM with integrated graphics

The E<sup>2</sup>Brain Computer-On-Module, that complies with the E<sup>2</sup>Brain standard for RISC-based COMs, is based on Freescale's MPC8347 processor (or optionally the MP-C8347E) with integrated Security Engine; its dazzling



E<sup>2</sup>Brain EB8347 with Freescale MPC8347 processor

features include an integrated DVI graphics port, TTL flat panel interface, two USB 2.0 ports (480 Mbit/s), and 1008 MIPS @ 533 MHz. For the first time, two functions can be integrated into an E<sup>2</sup>Brain-based RISC system: sophisticated HMI, and real-time controls. With this level of functionality, the EB8347 is in harsh environments an excellent alternative for x86-based COMs.

The virtues of RISC shine through: excellent computing power with minimal power consumption, an extremely robust mechanical design – with an

extended temperature range of 0°C to 70°C (optionally -40°C to +85°C) – and anticipated availability of seven years or more. Potential applications for the new E<sup>2</sup>Brain module can be found in the automation, medical technology, energy, defense, or transportation and automotive industries, to name but a few. Examples in the transportation industry include cockpit computers in cars and trains, construction machinery, and even onboard yachts.

Thanks to the maturity of the module technology, OEMs that use the EB8347 can concentrate on their core competences and significantly reduce their time to market. Along with the attractive MPC8347 processor with integrated user interfaces, the E<sup>2</sup>Brain EB8347 boasts two Gigabit Ethernet interfaces and

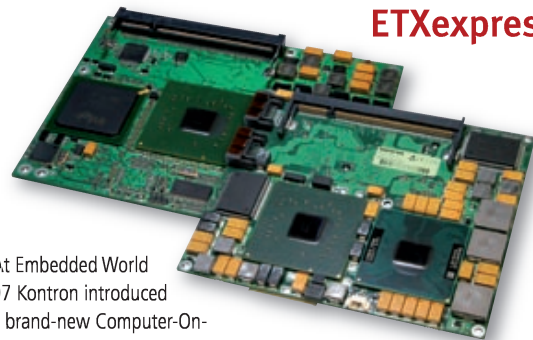
up to 256MB directly soldered fast DDR-SDRAM. Additional features include up to 64MB Flash, E<sup>2</sup>Prom for user and configuration data, 4 serial ports (2 terminal ports Rx/Tx, 4x 16550-compatible), an AC97 audio interface, and an interface for CompactFlash storage cards (slot on the carrier board).

Furthermore, RTC, Watchdog, and temperature sensors are on board. Customer-specific expansions are connected via LPC and/or 32 bit, 33/66 MHz PCI bus interfaces. The board requires only a single 3.3 volt power supply.

An operating system-independent boot loader with network support and a Linux and VxWorks board support package are available as software support.

[www.kontron.com/app11](http://www.kontron.com/app11)

## 64 Bit Intel Core 2 Duo for ETX and ETXexpress



At Embedded World 2007 Kontron introduced two brand-new Computer-On-Modules: the COM Express based ETXexpress-CD with Intel Core 2 Duo T7400 processor (2 x 2.16 GHz / 667 MHz FSB / 34 W) and the ETX 3.0-compliant ETX-CD with low-voltage Intel Core 2 Duo L7400 processor (2 x 1.5 GHz / 667 MHz FSB / 17 W).

Equipped with the Intel mobile 945GM Express chipset and the ICH7-R Southbridge device, both COMs achieve unequalled performance-per-watt ratios. The Intel Core 2 Duo technology delivers increased performance at comparable processor-frequency and without increased power consumption, in comparison to the previous generation Intel Core Duo. This is achieved by doubled L2 Cache (4MByte), an improved internal architecture and 64-bit support.

The Kontron ETXexpress-CD is a high-end Computer-On-Module

COM ETX-CD and ETXexpress CD with Intel Core 2 Duo

(COM) designed in accordance with the PICMG COM.0 standard that was created by Kontron for particularly performance-hungry new applications without legacy interfaces.

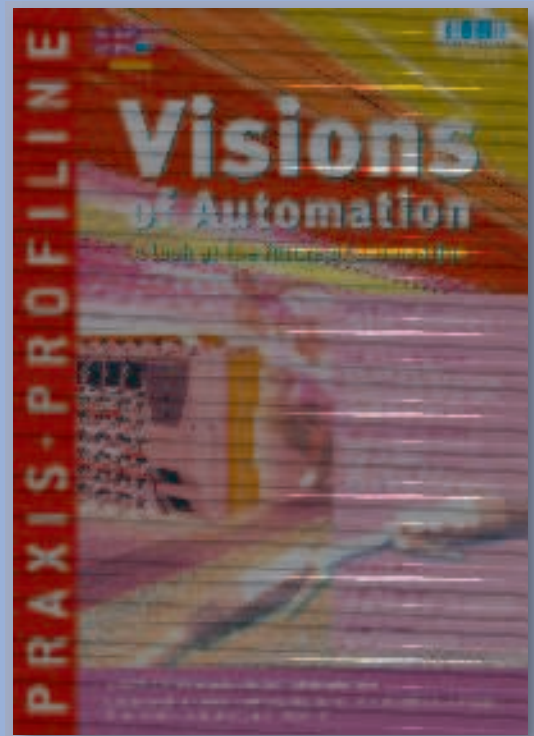
Built around the Intel Core 2 Duo processor, the RoHS-compliant Kontron ETX-CD is the high-end COM for embedded designs requiring PCI, ISA, SATA and USB 2.0 as well as all standard ETX interfaces. The launch of the Kontron ETX-CD underscores the long-term availability of the world's top-selling Computer-On-Module (COM) standard, ETX.

[www.kontron.com/app12](http://www.kontron.com/app12)

# Automation: Solutions for 2007

This issue of PRAXIS PROFILINE provides a comprehensive insight into the future of automation. It accompanies the international SPS/IPC/Drives 2006 automation show, and takes a look at new solutions, products and applications which we will see in the industry in 2007. The main topics in the fifth issue of VISIONS of Automation will be familiar to visitors and exhibitors of the show: Industrial Ethernet in Automation, Wireless Communications, Safety and Security in Automation. The bi-lingual edition is intended to familiarize international and domestic customers with the developments in the german market for industrial automation.

A VOGEL publication



#### In collaboration with:

Bosch Rexroth AG	<a href="http://www.boschrexroth.com">www.boschrexroth.com</a>
BTR NETCOM GmbH	<a href="http://www.btr-netcom.com">www.btr-netcom.com</a>
Danfoss GmbH	<a href="http://www.danfoss.com">www.danfoss.com</a>
Hirschmann Automation and Control GmbH	<a href="http://www.hirschmann.de">www.hirschmann.de</a>
Indu-Sol GmbH	<a href="http://www.indu-sol.de">www.indu-sol.de</a>
Reichle & De-Massari AG	<a href="http://www.rdm.ch">www.rdm.ch</a>
Rittal GmbH & Co. KG	<a href="http://www.rittal.de">www.rittal.de</a>
ROHDE & SCHWARZ GmbH & Co. KG	<a href="http://www.rohde-schwarz.de">www.rohde-schwarz.de</a>
Telegärtner Karl Gärtner GmbH	<a href="http://www.telegaertner.de">www.telegaertner.de</a>
Weidmüller GmbH & Co. KG	<a href="http://www.weidmueller.de">www.weidmueller.de</a>

**Fax +49 931 418 - 2543**

[Anja\\_Kemmer@praxis-profiline.de](mailto:Anja_Kemmer@praxis-profiline.de)

**Yes,** please send me the marked title for the price mentioned plus forwarding expenses  
(Germany 2,50 €; foreign country 5 €)

PRAXIS PROFILINE  
Visions of Automation  
Edition 2006  
English/German  
ISBN 3-8259-1943-9

Price per copy  
€ 19,80

#### Sender

Name, first name \_\_\_\_\_ Company \_\_\_\_\_

Address \_\_\_\_\_

Telephone/Fax \_\_\_\_\_ E-mail \_\_\_\_\_



# Flexible and high quality

*Main expertise: electronic development, system integration and manufacturing of complex electronic products*



*datakamp System GmbH develops, manufactures and sells electronic system components for industrial applications. At the forefront are modern embedded computer systems, on the basis of ARM, Xscale and X86 architectures.*

datakamp System GmbH  
Brillenburgsweg 29  
D-21614 Buxtehude  
Deutschland/Germany  
Tel. ++49 (0) 4161-5007-0  
Fax ++49 (0) 4161-5007-10  
info@datakamp.de  
www.datakamp.de

datakamp GmbH offers its customers expertise and specialist knowledge in the areas of electronic development, system integration and the manufacture of complex electronic products.

Competent project planning and years of experience in electronic hardware and software development form an important basis for the success enjoyed by our customers.

The customer can draw upon our services in the development and engineering of hardware and software components either individually or as a project, depending on his requirements.

We ensure our customers' success in series manufacture by collaborating with the customer to carry out complex test procedures on the series products under operational conditions.

Certification processes, such as CE certification for example, are just as much part of our project work as are the maintenance and continued development of the product, which we work on independently upon demand.



Windows® CE 5.0 on the X-board GP8

## Know-how and expertise

### Hardware development

- ▶ Baseboard development for the Kontron COM module X-board™, ETX
- ▶ JFLEX I/O module for Kontron 3.5 embedded SBC JREX boards
- ▶ Advanced system electronics
- ▶ Field bus electronics
- ▶ Power supply systems

### Software development

- ▶ System software adaptations
- ▶ Windows driver development
- ▶ Board support packages (BSP)
- ▶ X86 BIOS development

### System development

- ▶ Design of housings, frames and screen fronts for the system layout.
- ▶ Creation of system documents and manufacturing manuals.

### Sales

- ▶ Concept support
- ▶ Logistic counselling
- ▶ Support in production and sequence planning

### Manufacture

- ▶ Conventional and SMD mounting
- ▶ Pre-assembly and final assembly
- ▶ End test of the devices and systems
- ▶ Specific climate test procedures



X-board GP8

### Logistics

- ▶ SMD component warehouse
- ▶ Complete material logistics

### Main focus of the segment

- ▶ Rail / traffic technology
- ▶ Medical engineering
- ▶ Plant and mechanical engineering
- ▶ Automation technology

### Reference project

#### Windows® CE BSP GP8

In a high-calibre project for the company Kontron AG, we were able to demonstrate our speciality, the embedded Windows CE integration.

For the X-board GP8 with Intel XSCALE IOP80219 processor, datakamp was able to successfully integrate the Windows CE embedded system software in the form of a board support package.



# All the know-how of a reliable partner



*Fortec Technologies combines the technical know-how and the project-management skills of the Fortec Group. We specialize in development of embedded systems for industrial applications. Team up with our engineers for a perfect solution for your embedded project.*

FORTEC Elektronik AG  
Lechwiesenstr. 9  
86899 Landsberg am Lech  
Telefon: +49 (0) 8191 - 911 72-0  
Telefax: +49 (0) 8191 - 2 17 70  
info@fortecag.de  
www.fortecag.de



■ Demanding customers require the usage of leading edge technologies in their products. So latest technologies in both, hard and software development as well as high quality implementations are the basics of our solutions.

Paramount for successful completion of an embedded systems custom project is a professional project management. We work closely and openly with our customers to create an atmosphere of trust.

There are six Fortec Sales Offices across Germany, dedicated design specialists are deputized to your project. We strive for finishing our common projects in the right time and at the right budget.

Feel our experience, trust on the financial stability of the public listed Fortec AG.

### Hardwaredevelopment

- ▶ Baseboarddesign for ETX, ETX-Express, X-Board
- ▶ Custom CPU-Design
- ▶ Custom I/O-Boards (VME, CPCI, PCI, PCI-Express)
- ▶ Custom Displays

- ▶ FPGA-Design, VHDL
- Designtools: PADS, AutoCAD
- Softwaredevelopment**
- ▶ Embedded Applicationssoftware
- ▶ RTOS
- ▶ MMI
- ▶ Data-collecting and analysis
- ▶ Processprogramming in IEC 1131
- ▶ Designtools: Delphi, Kylinx, MS Visual Studio, Tornado
- ▶ OS-Focus: embedded XP, embedded Linux, VxWorks

### System-Consulting

- ▶ Review of concepts

### Production

- ▶ Throughhole and SMD
- ▶ Purchasing, stocking of EOL-components
- ▶ System assembly
- ▶ Full testing of all Systems and boards

### Certification

DIN ISO 9001:2000  
Audited supplier for: Siemens VDO

Automotive, Unaxis AG,  
AEG MIS

### Industry Coverage

- ▶ Railway, Transportation
- ▶ Automation
- ▶ Medical
- ▶ Point of Information

### References

„TOP142“, a 42" Point of Information Terminal for the National Railway Systems.

A 42" HDTV-display (1920 x 1080 resolution) is controlled by an embedded PC via the LVDS-Interface and a custom JILI-file. The display and the embedded PC are mounted in a vandal-proof IP64 housing. The embedded PC is based on an ETX-PM Modul with Intel Celeron 600 MHz Processor on a custom baseboard. The baseboard combines the standard PC-interfaces with a display-management-system that controls the display's brightness as a function of ambient temperature and brightness.

Passenger-information is displayed via XML-telegrams. The Linux-based software is also a custom design by Fortec Technologies. ■



# Solutions, Service and Support from one Source

*Main expertise: Specialized Distributor for Embedded Computing and Display Technology*



*HY-LINE Computer Components GmbH is specialized in sales and support of embedded computing and display technology*

Rudolf Sosnowsky

HY-LINE Computer Components is as a member of the HY-LINE group – five entities acting under a holding company, each of them being a specialist in a different product range – active in embedded computing and display technology. This conception has been proven since more than 15 years. The headquarters are located in Unterhaching close to Munich, and sales engineers in local offices all over Germany and Switzerland look after customers in industry, information technology and medical equipment. A technical support team with a lab of their own and a direct link to vendors in Far East and USA offers proficient knowledge in all details of products and applications.



Rudolf Sosnowsky is Vice President Marketing of HY-LINE Computer Components GmbH in Unterhaching/Munich

[www.hy-line.de/computer](http://www.hy-line.de/computer)



*Solutions instead of components*

### Know-how and expertise

#### Flat Display Solutions

TFT controller boards by Kontron

- ▶ CRTtoLCD-5 – efficient solution
- ▶ CRTtoLCD-6 – compact size
- ▶ CRTtoLCD-7 – the multimedia machine

#### TFT displays from 2 up to 55 Inches diagonal size and display accessories

- ▶ Measurement instruments
- ▶ Industrial terminals
- ▶ Video players
- ▶ Multimedia terminals
- ▶ Public Information

#### Touch screens by ELO

- ▶ AccuTouch: resistive five-wire screen
- ▶ IntelliTouch: acoustical surface wave
- ▶ SecureTouch: hardened glass
- ▶ Surface Capacitive: robust glass surface
- ▶ Projected Capacitive: operation behind glass front

#### Services

- ▶ Configuration of display kits
- ▶ Parameterisation
- ▶ Implementation of specific timings

#### Embedded Modules

- ▶ Complete MMI (Man-Machine-Interface)
- ▶ Industry proof
- ▶ Non-rotating mass storage

#### Single Board Computer Configurator

- ▶ Interactive tool on the web site
- ▶ Selection of optimum configuration
- ▶ Overview on alternatives
- ▶ Pre-selection for consultation of sales engineer or marketing specialist

#### Long Distance Solution Video data

- ▶ Remote terminal
- ▶ Server remains in server room
- ▶ Ideal for rough environment

#### Construction

- ▶ Transmission via fibre optics
- ▶ Full bandwidth
- ▶ Transparent operation
- ▶ Hotplug and DDC

#### Entry with USB

- ▶ Touch screen



*Optical DVI cable*

- ▶ Keyboard
- ▶ Mouse
- ▶ Incremental encoder
- ▶ Special keys

#### Construction

- ▶ Transparent operation
- ▶ No special drivers necessary
- ▶ Seamless integration into operating system

#### Integrated solution Inova GigaStar

- ▶ Electrical isolation
- ▶ Isolation (medical equipment)
- ▶ Long distance without loss

#### Construction

- ▶ DVI + USB + Audio + RS-232
- ▶ One CAT5 cable (Ethernet) only
- ▶ Full bandwidth
- ▶ More than 1000m distance over fibre

#### Chips for Signal Processing Integrated Circuits Silicon Image

- ▶ DVI transmitters and receivers
- ▶ HDMI transmitters and receivers
- ▶ Serialised data transmission
- ▶ SATA, hardware RAID

#### Silicon Motion Graphics Controllers

- ▶ Low power consumption
- ▶ Compact package
- ▶ Additional features (USB, camera port)

#### Flash Controllers with versatile interface

- ▶ Compact Flash (CF)
- ▶ USB
- ▶ SD Card
- ▶ Multi Media Card (MMC)

# Speed & versatility

*Core expertise: the development and production of OEM baseboard products*



*ies Industrie-Elektronik Schmitz GmbH & Co. KG – synonym for intelligent embedded systems – develops, produces and markets electronic system components which are designed for industrial applications.*

Gerhard Steger

The company has a team of 32 experienced professionals working in hardware and software development, production and device testing, making it the ideal partner for development, series production and support of customer and application specific electronic products.

The company's core expertise includes the development and production of OEM baseboard products which use x86 and similar processor architectures. The ies product range combines great flexibility and per-



*Dr.-Ing. Gerhard Steger is the CEO of ies Industrie-Elektronik Schmitz GmbH & Co. KG in Kierspe, Westfalen/Germany*

[info@ies-gmbh.de](mailto:info@ies-gmbh.de)  
[www.ies-gmbh.de](http://www.ies-gmbh.de)

formance with short development cycles and affordable development costs. The company leverages its expertise to offer a broad range of products and services.

## Know-how and expertise

### Hardware development

CAD system: Protel expertise:

- ▶ baseboard designs for Kontron COM modules (ETX, ETXexpress, X board, DIMM PC)
- ▶ system electronics for fieldbus applications
- ▶ system electronics for production optimization applications (for example to minimize cabling requirements)

### Software development

Development systems: KDevelop, Kylix, Delphi, Microsoft SDKs expertise:

- ▶ operating system modifications
- ▶ driver development, modification and support especially for embedded Linux, Windows XPe and CE
- ▶ application development
- ▶ process programming (PLC & SoftSPS)
- ▶ development of test software

### System development

CAD system: TreeCAD expertise:

- ▶ generation of system documentation
- ▶ generation of production documentation
- ▶ rapid prototyping
- ▶ system design for extended product life cycles

### Sales

expertise:

- ▶ system and form factor advice



*Customized ETX-Design*

- ▶ design support
- ▶ logistics advice
- ▶ production planning support

### Production

- ▶ conventional and SMD technology
- ▶ cutting and non-cutting metal and plastic production
- ▶ operations (milling, drilling, turning, riveting gluing, etc.)
- ▶ cable fabrication
- ▶ final assembly

### Testing

- ▶ complete systemtest and test protocol
- ▶ temperature test (-50 to +100 °C)
- ▶ EMV- and vibration test

### Logistics

core expertise:

- ▶ SMD component stock
- ▶ project-specific buffer stock
- ▶ stock of discontinued modules

### Certificates

- ▶ DIN ISO 9001:2000
- ▶ certified/audited Fresenius Hemo Care supplier
- ▶ certified VW suppliers

### Our strengths

- ▶ geographic focus
- ▶ Germany

- ▶ German-speaking region
- ▶ English-speaking, European region

### Industry focus

automotive industry & automotive suppliers  
rail/transportation  
vending machines  
medical equipment  
automation equipment  
home automation  
mobile & portable/battery-operated applications

### Reference project

#### Clinical workstation

The CWS-3 Clinical Workstation is a top-quality panel PC for medical applications based on the ETX-PM module with an Intel Pentium M 1.1 GHz processor and a customer-specific baseboard.

The high-resolution 19-inch touchscreen display acts as a multi-purpose user-interface for all standard medical applications. A non-contact identification interface is provided to facilitate user authorization. The device is IP65 dust and hose proof per IP65 requirements.



*Reference project: CWS-3 Clinical Workstation*

# Comprehensive range

*Core expertise: technical advice,  
design support and logistics  
services*

**ineltro**

*Ineltro AG is an independent, local industrial electronics and computing solutions distributor which has its headquarters in Regensdorf near Zurich. In addition to providing technical advice and design support, we offer*

*valuable logistics services from our local warehouse to a broad customer base in the industrial, medical equipment, telecommunications, IT, safety equipment, automotive, consumer and other market segments.*

#### **The strengths of Ineltro AG:**

Ineltro works with a balanced international vendor base to supply the best possible mix of products

to the Swiss industrial market. The following areas are particular strengths of our product portfolio:

- ▶ industrial computing, system solutions, keyboards, displays
- ▶ batteries, power supply modules, power components, protection circuits
- ▶ electro-mechanical components/connectors
- ▶ microcontrollers, timing products, wireless solutions

Ineltro AG offers a broad range of solutions for a variety of applications, for example protection components (overcurrent and overvoltage

protection circuits from various manufacturers), power supplies, batteries and products for the expanding industrial computing sector.

**Industrial computing:**  
We source single board

computers and modules from well-known manufacturers in a variety of form factors as well as a range of other products including solutions for medical applications and rugged laptop computers for field use. The experts at Ineltro can supply complete systems including memories, displays, cables and keyboards or trackballs.

#### **Business partners:**

Aaeon, Assmann WSW, Axon, C&D Technologies, Cherry, Clover Displays, EIB/KNX, Enfora (GSM), Epcos, Epson-Toyocom, Fastrax, Hotec, JAE, Kontron, Kundo XT, Lear/Grote&Hartmann, Litemax, Littelfuse/Teccor, Man and Machine, Micro Cystal, Microchip, New Japan Radio, Nippon Chemi-Con, Noritake, NSI, ODU, Pulse, Raychem Circuit Protection, Sandisk (msystems), Sanyo, Sauro, Shindengen, Simtek, Sunny, Tadiran Batteries, Tectus, Vitrohm, Winstar, Zilog

No. of employees: 25  
Quality management: ISO9001

Ineltro AG  
Riedthofstrasse 100  
8105 Regensdorf  
Switzerland  
Tel. +41 (0)43  
3437300  
Fax +41 (0)43 3437309  
contact@ineltro.ch  
www.ineltro.ch

# Successful for more than 30 years

*Ultratronik: From distributor to industrial system solutions provider*



*Products of Ultratronik are essential in automation and process controlling. The current product portfolio ranges from electronic components to servers, from industrial displays to so called Open Frame Smart Panels with included operating system.*

### Manufacturing – logical step to fully customized products

13 years ago, with their own UMC- solutions, Ultratronik changed their focus to development and manufacturing. „Today, we are very successful in MMI solutions and profit from our comprehensive know-how we could get from manufacturing. Our combined competences in hard- and software today give us a decisive competitive advantage“, Alexander Sorg, CEO of Ultratronik, explains. It comes as no surprise that Ultratronik’s portfolio centres around customized MMI solutions, based on a complete set of displays compatible size and resolution.“ Since more than 20 years, we are very successful in this segment, profiting from long co operations with leading manufacturers“, Sorg emphasizes. „Thus, we are enabled to offer our Customers a guaranteed, long-term availability for our OFSPs (Open Frame Smart Panels) and industrial displays. This is very crucial to our customers when it comes to investments“, Sorg adds.

Since the company’s foundation, its claim has ever the stayed the same: „Solutions for your success!“



### Individualized solutions and development support

In general, clients from numerous branches of industry have the same goal: They want to cut costs and time necessary to develop their own processing control systems.

Apart from that, they need development support, especially in integrating new products in their already existing soft- and hardware infrastructures. For most of Ultratronik’s customers, switching to Linux based embedded systems for the first time, is a milestone in entering a so far unknown operating system world. They appreciate Ultratronik’s extensive support in the areas of software, hardware, Linux and Web based technologies.

### First embedded system based on E<sup>2</sup>brain

Stunning user benefits through new Computer-On modules for RISC-based systems Shortly after ULTRATRONIK had founded the E<sup>2</sup>Brain Interest Group for development and marketing of standardised, RISC-based Computer-On modules together with KONTRON and other partners in January 2006, the company introduced its first embedded system based on the new COM-standard during Embedded World 2006.

### Short development cycles – cost-efficient solutions

The usage of interchangeable, scalable standard modules based on E<sup>2</sup>Brain offers decisive advantages to system integrators concerning Time-to-Market as competitive factor.

So far, these advantages were limited to developments based on

x86 technology. By means of the new E<sup>2</sup>Brain standard, also RISC-based applications profit from these advantages. Generally speaking, E<sup>2</sup>Brain modules offer high data processing power, high communication levels and at the same time low power consumption, as they are operable in an extended temperature range.

For Alexander Sorg, the most evident advantage in widely promoting the new standard is that this new approach perfectly matches Ultratronik’s customer-oriented product philosophy: “E<sup>2</sup>Brain as a new, open Computer-on-Module standard, is a cost-efficient approach, especially for very price-sensitive embedded applications, which until now were dominated by x86 designs”.

“Like Ultratronik, Kontron has the dedicated target to promote modules



Ralf Neuner

for the market of Embedded RISC designs and make those become State-of-the-Art“, adds Ralf Neuner, Head of Sales

and Marketing at Ultratronik. “We will change the market of customer-specific RISC solution developments decisively“, Neuner adds.

### New Ultratronik solution UMC-AU1550

In the framework of the cooperation with Kontron and others, Ultratronik is now offering an E<sup>2</sup>Brain solution named UMC-AU1550, comprising AMD Au1550 and integrated Security Engine from SafeNet.

This system convinces by its highly performing 500MHz-network processor, which includes an integrated hardware encryption.

ULTRATRONIK GmbH  
Gewerbestr. 52  
D-82211 Herrsching  
Fon: +49 8152 3709-0  
Fax: +49 8152 5183  
mmi@ultratronik.de  
www.ultratronik.de/mmi

# Profound Know how

*Main expertise: Development and production of embedded solutions for industry and automotive*



*The company b-plus GmbH is based In Deggendorf, Germany and specialised in development and production of embedded solutions in the industrial and automotive market.*

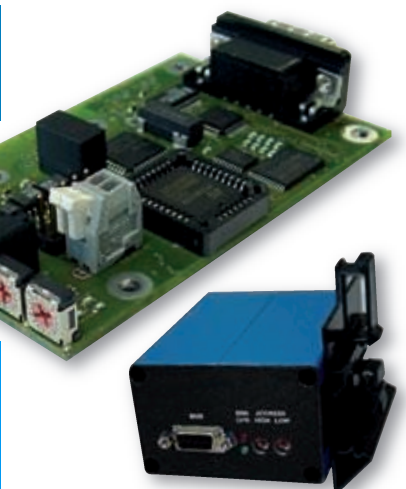
In 1996 Prof. Dr. Jörg Böttcher founded and gave the name to the company which, from the very beginning was oriented to Engineering Services whereby a profound experience in diverse Market Segments was accomplished within the first years. From 2001 onwards a clear orientation to automotive applications made b-plus a partner for developments of complex software topologies for control units in Driver Assistance Systems (i.e. Adaptive Cruise Control, Lane Departure Warning). Concurrently a further team of the company was dedicated to hardware developments, emphasising customer specific projects in the industrial environment. Additionally an own product portfolio was launched and marketed which in the year 2003 was awarded by the City of Deggendorf with the Innovation-Price for outstanding developments in the field of gateway products.

In 2004 b-plus became one of the first ETX Certified Partner Companies of Kontron and since 2005 additionally reached the status of a Kontron VAR (value added reseller), thus became qualified as a development partner and as a preferred Kontron sales-partner. Utilizing the Kontron CPU Modules (DIMM-PC, X-board, ETX, ETXexpress) b-plus successfully turned around several projects within this technical environment. In cooperation with the OEM customer baseboard designs, adapted for diverse CPU architectures were defined, developed and manufactured while the customer was assisted and supported by a comprehensive project management along the value chain. Hereby the long experience

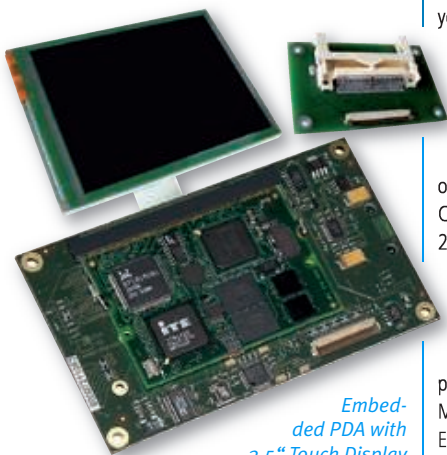
from the automotive field is applied and expressed in terms of quality in specification, design and production at the highest degree of reliance. The customer does not only benefit from the competency in technology but also from the intrinsic cross over know how of the complete development team at b-plus. As for today this team counts 12 developers (all with an academic degree of electronics engineering) and forms the backbone and strength of the company, which wants to be understood as the absolute professional partner for system solutions in the area of embedded applications.

### Core Competencies:

- ▶ Requirement definition and specification up to total system integration
- ▶ Schematics and logic design for embedded HW & baseboard development (RISC / x86)
- ▶ Interface implementation for CAN/CANopen, LIN, Modbus, Profibus DP buses
- ▶ Building of ESD conform layout (ESD Testlab available in the Group Holding)
- ▶ Firmware- and software- development, drivers development and adaptation (i.e. WinCE)
- ▶ Documentation of development, generation of testing instructions / -software
- ▶ Manufacturing of prototypes and series production, assembly and housing
- ▶ Outgoing testing and performing of or assistance in external accreditations



*Fieldbus-coupler: Circuit Board and enclosure*



*Embedded PDA with 3,5" Touch Display*

### Target markets and typical applications:

- ▶ Mobile / space limited applications with extended requirements
- ▶ Automation- and control technology with/without visualisation
- ▶ HMI solutions as well as digital customer information systems
- ▶ Network applications with bus interface in Industry/Automotive

### Reference application examples:

- ▶ Embedded PDA with PXA255 X-Scale and WinCE 5.0 operating system
- ▶ Building automation utilizing PXA255 and diverse bus interfaces
- ▶ Navigation Platform with dual display 16:9 on GP8 Module
- ▶ Mobile POS system on ETX platform (i.e. Intel Pentium M)

b-plus GmbH  
Ulrichsberger Str. 17  
D-94469 Deggendorf  
Tel. +49 (0) 991 270 302 0  
Fax +49 (0) 991 270 302 99  
www.b-plus.com  
services@b-plus.com

# Head in the clouds...

*and feet on the ground...*



*The dialogue with our customers has always shown one thing very clearly: what they want is an overall approach – the optimum interplay of individual elements, which in the long run leads to a perfect solution.*



next system Vertriebsges.m.b.H.  
 components & solutions  
 Dresdner Straße 68/1/3  
 A-1200 Wien  
 Tel +43 (01) 33166-0  
 Fax +43 (01) 33166-100  
 info@nextsystem.at  
 www.nextsystem.at



With a team of over 20 persons next system has made itself a very good name in Austria within only 5 years. Since May 2001 the entire team managed by the two founders Robert Gausterer and Andreas Tragenreif pursues the goal of satisfying expectations and desires of their customers or better to even exceed them! The statement "where the possibilities of the usual trading ventures ends, next systems competence starts" shows the deep desire to be more than a pure trading company. And exactly that is particularly appreciated by numerous small and very large customers.

By individually customized solutions next system aims at a long-term partnership business relation with the customers. High quality and professional system solutions, lived partnerships and an excellent price performance ratio as well as joy in the activity form the basis for the daily work.

## Business area of next system

### Motion technology

- ▶ DC-micro and small motors
- ▶ Permanent magnet DC motors
- ▶ Brushless DC motors
- ▶ Stepper motors and controllers
- ▶ Low cost motors

- ▶ Spur-, planetary- and worm gear box



- ▶ Accessories and controllers (hardware and software)
- Attentive listening and careful design get our customers up to speed.

### Industrial computer

- ▶ Embedded modules - COM
- ▶ Single board computer
- ▶ Compact PCI
- ▶ Industrial PCs and box PCs

Target oriented needs and counseling for the determination of optimal technologies for your requirements with exact adjustment and he necessary capacity reserves.

We like to meet those requirements.

Many years of experience of the whole team, curiosity and creativity enables – together with the customer – to develop the best solution.



### Displays & touch screen

- ▶ TFT displays
- ▶ Alphanumerical / graphic LCDs
- ▶ Controller
- ▶ Resistive touch screen
- ▶ Capacitive touch screen
- ▶ SAW – touch screen

Hard and long lasting development of the worlds leading manufacturers and the profound understanding of matter makes next system an essential partner in the area of touch screen and displays solutions. Besides the components we offer complete solutions from one source – this saves money and avoids (probably) anger.

### System solutions – Solutions with system

- ▶ Motion technology solutions
- ▶ customised industrial PCs
- ▶ Industrial TFT monitors
- ▶ customised front panels with assembled touch screen
- ▶ Multimedia and POS solutions

The know how of the single products is consistent to system solutions from one source. This attests in our clientele on the sectors of automation technology, automotive industry, industry electronics, information technology, communication techniques, machine, plant- and special machine construction, traffic and multimedia techniques to medical systems.

# Excellence & Independence

*Main expertise: Complete solutions from customized to COTS systems*



*VENCO ELECTRONICA offers the possibility to provide complete embedded solutions where each system has been tested and qualified.*

■ We easily identify the right solution for each application, thanks for the variety of demo kits already developed at Venco Lab.

There is a confident solution for your system, trust in our engineers and let us offer our consultancy service.

#### Welcome to Venco

#### Know-how and expertise

Venco has a long experience in COM developments, in contact with local engineering for custom base boards.

#### Main developments

##### Panel PC based on ETX:

- ▶ Solutions from 5" to 17"
- ▶ Developed and tested monitor solutions from our LCD franchises

##### Custom shoe box PC:

- ▶ Based on customer request we provide the right performance in a fanless solution



Ultraflat SBC by Venco

#### Dual view system:

- ▶ For customer interest to manage graphic solutions, we are the right local contact.

Deep knowledge in embedded linux development for embedded systems

#### Portfolio

- ▶ Semiconductors
- ▶ Power and discrete devices
- ▶ Systems and Displays
- ▶ Power supply
- ▶ Communications

#### Major markets

- ▶ Gaming
- ▶ Vending machines
- ▶ Industrial automation
- ▶ Weight Scales

- ▶ Electromedical
- ▶ Instrumentation
- ▶ POS and ticketing
- ▶ Professional Audio Equipments
- ▶ Security
- ▶ Elevators and escalators
- ▶ Lighting & Home Automation
- ▶ HVAC (Heat-Ventilation-Air-Conditioning)
- ▶ Wind power generators
- ▶ Auxiliary power for railways
- ▶ Design houses and engineering's

#### Our strengths

- ▶ 25 Years of experience in the Spanish Market and our brand name as local Distributor.
- ▶ Deep introduction on the R&D+i centers of the industrial market in Spain.
- ▶ Financial strength

VENCO ELECTRONICA S.A.  
Head Quarter - Barcelona  
Carretera del Mig 75  
E - 08907 L'Hospitalet de Llobregat  
Tel. (34) 93 263 33 54  
Fax. (34) 93 263 33 23  
www.vencoel.com

Central Office – Madrid  
C/Castrobarro 10  
E- 28042 Madrid  
Tel. (34) 91 329 55 00  
Fax. (34) 91 329 59 25

Northern Office  
Sasikoa 26 3º CD  
E - 48200 Durango  
Tel. (34) 94 623 26 48  
Fax. (34) 94 620 21 85



# COM Design Partner and Reseller

## 1. Austria

**next system Vertriebsges.m.b.H.**  
Dresdnerstraße 68/1/3  
A-1200 Wien  
Phone: +43 1 33 166 0  
www.nextsystem.at

## 2. Belgium

**Koning & Hartman B. V.  
(formerly Getronics)**  
Woluwelaan 31  
B-1800 Vilvoorde  
Phone: +32 2 2570250  
www.koningshartman.com

## Texim Europe (Electronics N.V / S.A)

Gentsesteenweg 1154-C22  
Brussel  
BE -1082  
Phone: +32 2 4620 100  
www.texim-europe.com

Belgium, Netherlands, Luxembourg

**Kontron AG Benelux**  
Koning Albert I Laan 46  
BE-1780 Wemmel  
Phone: +32 2 4560642  
www.kontron.com

## 3. Czech Republic

**MITE Hradec Kralove Ltd.**  
Veverkova 1343  
500 02 Hradec Kralove  
Phone: +420 498 500 252  
www.mite.cz

## 4. France

**Axess Technology**  
3,5 Rue du Jura, Batiment Tokyo  
Silic 586  
F-94663 Rungis, Cedex  
Phone: +33 1 49 78 88 88  
www.axess-technology.com

## IRTS

639, Boulevard des Armaris  
F-83100 Toulon  
Phone: +33 5 56 61 74 69  
www.irts.fr

## Kontron France

Tour de l'Horloge  
4, Place Louis Armand  
F-75012 Paris  
Phone: +33 (0)1 30 17 89 51  
www.kontron.com/fr

## 5. Germany

**Aaronn Vertriebs- GmbH**  
Zeppelinstrasse 4  
82178 Puchheim / München  
Phone: +49 89 89 45 77 0  
www.aaronn.de

## b-plus GmbH

Ulrichsberger Str. 17  
94469 Deggendorf  
Phone: +49 991 270 302 0  
www.b-plus.com

## FORTEC Elektronik AG

Lechwiesenstraße 9  
86899 Landsberg / Lech  
Phone: +49 8191 9 11 72 0  
www.fortec-ag.de

## HY-LINE Computer Components Vertriebs GmbH

Inselkammerstr. 10  
82008 Unterhaching  
Phone: +49 89 614 503 40  
www.hy-line.de

## ies Industrie Elektronik Schmitz GmbH & Co.KG

Friedrich-Ebert-Str. 294-296  
58566 Kierspe  
Phone: +49 2359 9151 51  
www.ies-gmbh.de

## EMEA Sales Office

Kontron Embedded Modules GmbH  
Brunnwiesenstr. 16  
94469 Deggendorf,  
Phone: +49(991)37024-0  
www.kontron.com

## 6. Hungary

**Cason Engineering PLC**  
Velencei út 37.  
H-2030 Érd  
Phone: +36 23 522-100  
www.casonipc.com

## VARINEX Informatics Inc.

Köszeg u. 4  
1141 Budapest  
Phone: +36 1 273 3400  
www.varinex.hu

## 7. Italy

**RA.FI. SpA**  
Via Savona, 134  
I-20144 Milano (MI)  
Phone: +39 024 77 918 38  
www.rafi.it

## Kontron Italia s.r.l.

Via Kennedy, 34  
I-21040 Venegono Inferiore  
Phone: +39 0331 827 895  
www.kontron.it

## 8. Netherland

**Koning & Hartman B. V.**  
Energieweg 1  
P.O. Box 5080 -  
NL-2627 AP Delft  
Phone: +31 15 260 9906  
www.koningshartman.com

## 9. Portugal

### Comdist, Lda

Praceta do Comércio, nr 5A, Loja 1D  
Quinta Grande  
PP-2610-042 Alfragide  
Phone: +351 214 72 51 90  
www.comdist.pt

## 10. Russian Federation

### RTSoft

P.O. Box 158  
Nikitinskaya, 3  
RU-105077 Moscow  
Phone: +7 095 7426828  
www.rtsoft.ru

## 11. Slovakia

### MITE Kosice Ltd.

Nerudova 14  
SK-04001 Kosice  
Phone: +421 55 6250 677  
www.mite.sk

## 12. Spain

### Novatronic Sistemas S.L.

C/ Lezeaga, 7  
ES-48002 BILBAO (Vizcaya)  
Phone: +34 902 198 725  
www.novatronicsistemas.com

## Venco Electronica, S.A.

Carretera del Mig 75  
ES-08907 L'Hospitalet de Llobregat  
(Barcelona)  
Phone: +34 93 263 33 54  
www.vencoel.com

## Kontron Elektronik S.A.

C/ Gobelas, 21  
ES-28023 Madrid  
Phone: +34 917 10 20 20  
www.kontron.com

## 13. Ukraine

### IVL Equipment & Engineering Ltd.

Vasilenko 7, Off. 305  
UA-03124 Kiev-179  
Phone: +380 44 451 8733  
ivl.kiev.ua

## 14. United Kingdom

### Diamond Point

Unit 9, North Point Business Estate  
ME24LY Rochester, Kent  
Phone: +44 16 34 300 900  
www.dpie.com

## Kontron UK Ltd.

Ben Turner Industrial Estate  
Oving Road  
Chichester, West Sussex  
PO19 7ET  
Phone: +44 1243 523500  
www.kontron.com

## 15. Finland

### Arrow Finland

Kalkkipellontie 4  
FIN-02650 Espoo  
Finland  
Phone: +358 9 47 66 60  
Website: www.arrowfi.com

## 16. Sweden

### Trident Displays

Box 7119  
SE - 174 07 Sundbyberg  
Phone: +46 8 564 725 50  
www.tridentdisplays.co.uk

## 17. Switzerland

### Ineltro AG

Riedthofstraße 100  
CH-8105 Regensdorf  
Phone: +41 43 343 73 00  
www.ineltro.ch

## Kontron AG

Bahnstraße 58/60  
CH-8105 Regensdorf  
Phone: +41 43 305 88 75  
www.kontron.com

## 18. Poland

### Kontron East Europe sp. z o.o.

ul. Zupnicza 17  
PL-03-821 Warszawa Poland  
Phone: +48-22-389-8450  
www.kontron.pl

*Kontron Partner/Distributor  
Offices: <http://emea.kontron.com/index.php?id=1706>*