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SPECIAL ISSUE

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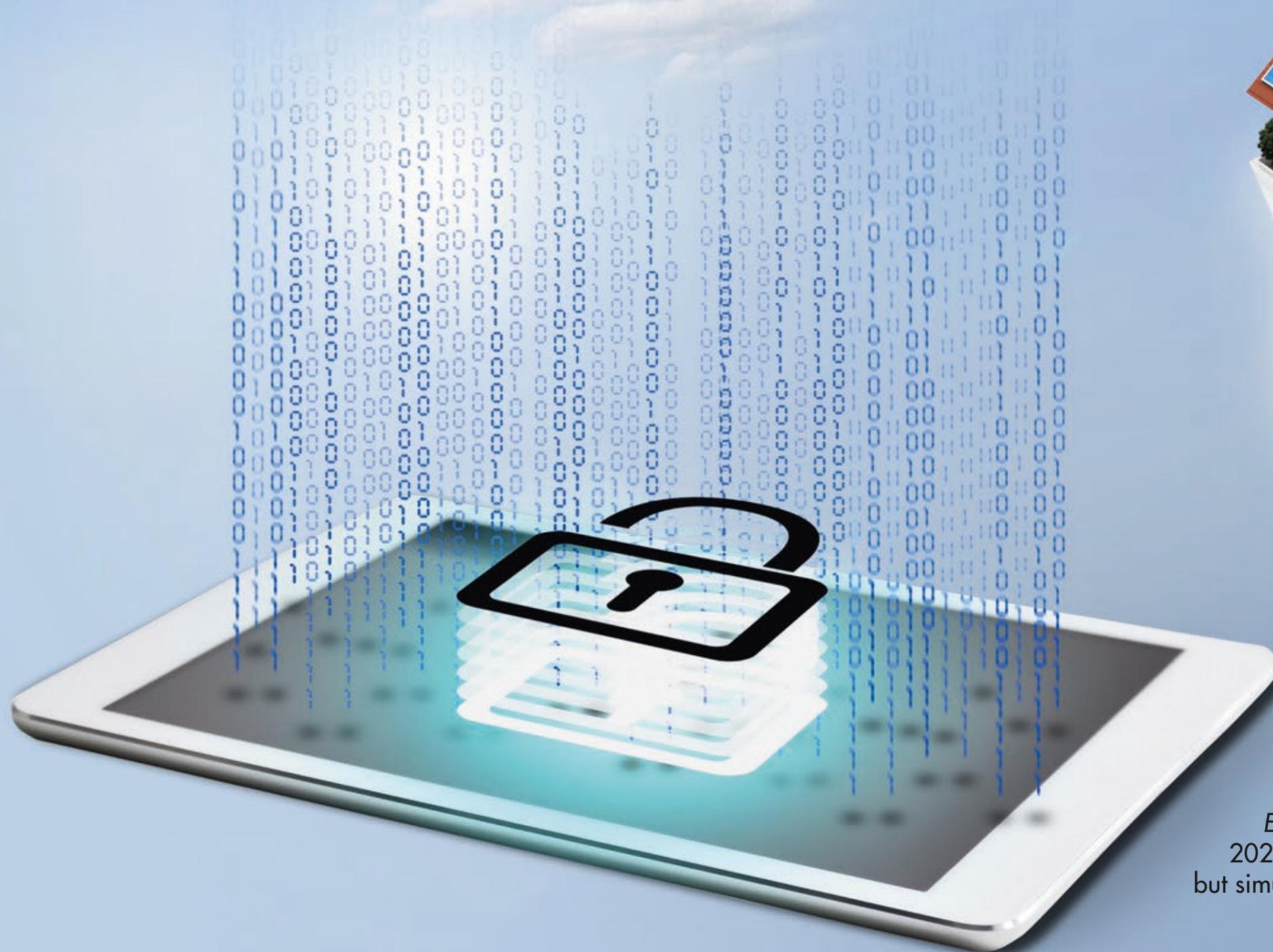


Automotive **Applications**

Firmware protection for MCUs enables security in IoT applications



Microcontroller-based systems in IoT applications require a high level of data security and functional safety. The solution presented in this article ensures both a secure firmware update as well as secure functional upgrades for XMC4000 microcontrollers. Also, it supports the simple implementation of functional safety.



The outlook for IoT applications is impressive. The Internet of Things should make roughly a 15 trillion US dollar contribution to the global gross social product in the next twenty years (*source: General Electric*), with an installed base of 28.1 billion units by 2020 (*source: IDC*). But these figures are not only impressive, but simultaneously alarming when one can ...

[Read more in the article starting on page XX.](#)

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Dear Readers,



The new year has just started and yet the most important event for the embedded community - the embedded world Exhibition & Conference - is imminent: same procedure as every year. But is this really true? No, because the worlds largest exhibition which is held this year from 23rd to 25th February in the fair halls of Nürnberg Messe is evolving year by year. It not only grows every year it also includes new areas and special shows. In 2015 more than 900 exhibitors from over 35 countries will present state of the art products and services to approx. 30,000 visitors. According to a survey of the organizer 87% of the visitors are involved in purchasing and buying embedded systems and services. The organizer awaits 1,500 attendees of the embedded conference.

Due to the increased networking of embedded systems the question raises: "How secure and protected are embedded systems?" For this reason embedded world 2016 will present for the first time the topic safety & security for embedded systems in a special area in Hall 4A which includes safety for hardware and software as well as protection against extern attacks and product piracy. Technicians will there find answers for the important questions for the embedded industry: How to protect embedded systems against attacks? How to design protected hardware and software for embedded solutions? How to monitor and track channels of attacks for embedded systems? The visitor will find there individual booths and also the Safety & Security Pavilion.

The embedded community is not only able to find the actual products and solutions in the exhibition halls but also to exchange experiences at the associated conference. The conference will be held in the Convention Center Nürnberg (CCN) close to the exhibition halls. According to the organizer the success of the embedded world conference is based on the active and eager contribution of the embedded community. The content of the conference is composed by an international jury and guarantees the necessary dissemination of knowledge as well as the annual discussion of the actual trends and developments. Speciality of this conference is its solution orientated lectures what means they help attendees in their daily work. Technicians will find valuable information which is not only of interest for individuals but also for the entire embedded industry.

According to the organizer the electronics display conference developed to the most important European B2B platform for all aspects of display technologies. The spectrum of topics includes this year the actual display technologies like LCD, OLED, or e-paper and flexible displays and 3D displays as well as graphical user interfaces and touch screens. Furthermore the wide range of display applications and the market trend of displays are topics of the electronic display conference.

As you can see – an absolute must for the embedded community to visit. I'm looking forward meeting you at the exhibition.

Yours Sincerely

Wolfgang Patelay
Editor



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Viewpoint 3

Cover Story

Radar in every bumper 6

Chips & Components

Firmware protection for MCUs enables security in IoT applications 11

USB 3.1 SuperSpeed flash drives for industrial/embedded applications 15

Well prepared for the six major markets of the future 19

Tools & Software

Tool environment opens door to integrated development 24

Portable, mobile-use oscilloscope with lab instrument performance 27

When the debugger becomes the basic tool for integration and testing 30

Hybrid verification for high-integrity software 32

Boards & Modules

Computer-on-Modules: lifting Skylake into the cloud 38

The flexible platform for IoT applications 41

SoC processors enable COM Express modules from 12W up 47

Embedded World News 50-55

Cover Story:

Radar in every bumper 6



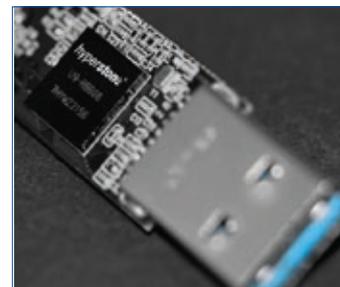
As the automotive industry aggressively marches toward huge advances in vehicle safety and ultimately to autonomous vehicles, major enablers will be RF and microwave technology, and millimeter-wave radars in particular.

Firmware protection for MCUs enables security in IoT applications 11



Microcontroller-based systems in IoT applications require a high level of data security and functional safety. The solution presented here ensures both a secure firmware update as well as secure functional upgrades for XMC4000 microcontrollers. Also, it supports the simple implementation of functional safety.

USB 3.1 SuperSpeed flash drives for industrial/embedded applications 15



This article introduces the new U9 USB 3.1 NAND Flash Controller combining USB SuperSpeed with power-fail robustness and reliability for industrial applications. It takes full advantage of the increased host interface performance, without any trade-off on the durability and reliability of the solution.

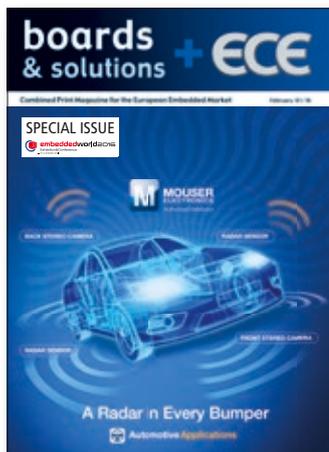
When the debugger becomes the basic tool for integration and testing 30

To ensure even better control of the very large volumes of data with embedded software nowadays, a new generation of debuggers is needed, which will provide users with extensive testing capabilities at the system level through to automated report generation, in addition to classic basic functions.

Computer-on-Modules: lifting Skylake into the cloud 38



Omnipresent Internet of Things (IoT) and Industry 4.0 trends are creating increasing demand among engineers for cloud-based services. New sixth-generation Intel Core COM Express Computer-on-Modules by ADLINK come with exactly the right features to fulfill these demands.



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Radar in every bumper

By Barry Manz, Mouser Electronic

As the automotive industry aggressively marches toward huge advances in vehicle safety and ultimately to autonomous vehicles, major enablers will be RF and microwave technology, and millimeter-wave radars in particular.

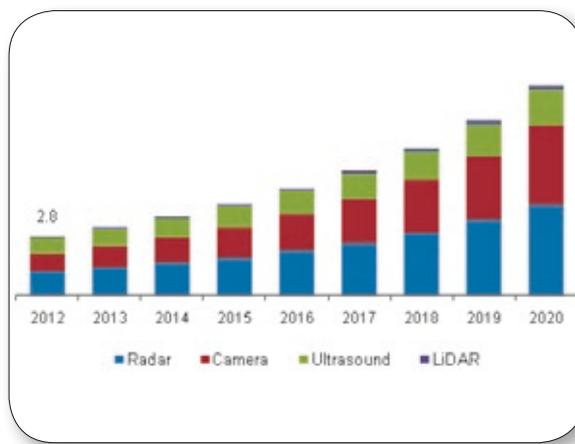


Figure 1. Estimates (in billions) from Grandview Research clearly show the steady upward march of radar in vehicles.

■ Not long ago, autonomous vehicles were the stuff of science fiction. Today, they're being tested throughout the world. Google autonomous vehicles alone have racked up more than 1.8 million miles (with a human on board for now) and logged only 12 incidents. There's little doubt that in the not-too-distant future, autonomous vehicles will become a commercial reality in some form. When that day comes, it will be thanks in no small measure to the versatility of radar, which is increasingly auto manufacturer choice for use in blind spot and side-impact detection systems and for adaptive cruise control.

Of course, radar is not alone in enabling nowadays rapidly-advancing vehicle safety systems. Infrared and visible-light cameras augment radar capabilities and have their own unique benefits, acoustic sensors are used in parking-assist systems, and radar optical counterpart (LIDAR) is also used in some vehicles. (LIDAR stands for Light Detection and Ranging.) However, even LIDAR-centric Google Prius test cars have two radars in the front bumper and two in the back. In less than a decade, radar has become available even in lower-cost compact cars, either as an option or increasingly as standard equipment. Radar accounts for more than 35% of the collision avoidance sensor market according to Grandview Research, and its market penetration is

increasing, surpassed only by cameras. One major characteristic that differentiates vehicle safety radars (from radars used for more traditional applications) is their much higher operating frequencies (76 to 80GHz), which were allocated internationally for this purpose. They were chosen because of their signal propagation characteristics and are defined as millimeter wave for their very small wavelengths. The millimeter-wave region is generally considered to begin above 30 GHz and until now frequencies above about 40 GHz have been devoid of activity other than by some scientific and military systems. There are several reasons for this. Foremost is that millimeter-wave signal propagation severely limits range and decreases in range as frequency increases. Tiny millimeter-wave signals are susceptible to attenuation by virtually anything in front of them, from rain and snow and even fog, to foliage and any solid structure. Even with a clear line of sight, range is much less than at the lower frequencies used by applications such as wireless communication and radio and television broadcast.

Millimeter-wave systems have traditionally been very expensive to manufacture, as their mechanical components such as antennas are very small and require precision machining. There are also only a few semiconductors that provide accept-

able performance (or work at all) at such high frequencies. All of these drawbacks could have been surmounted if there was a huge commercial market to drive down costs and fund innovation, but as none existed, the millimeter-wave region remained a frontier waiting to be conquered. Auto safety is that conquering hero.

Although the aforementioned characteristics make millimeter-wavelengths unappealing for most applications, they're actually beneficial for use by car safety systems. For example, the range-limiting characteristics of millimeter wavelengths in general do not apply to every millimeter-wave frequency because atmospheric absorption at some frequencies is less than at others. Reduced absorption increases usable range -- but not so much as to cause widespread interference, and as these spectral snippets are narrow in bandwidth. Consequently, frequencies between 71 and 81GHz are excellent regions for auto radar to operate.

Earlier, some applications operated at 24GHz where system cost was lower (although system size was larger) but the higher frequencies are now almost universally accepted. Another benefit of millimeter wavelengths is that only very low RF output power is required for radar systems, which for the auto cost-sensitive industry is essential and high power levels are very difficult to generate as well.

Improve 32-bit performance and connectivity with the PIC32MZ EF series

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A double-precision FPU, dedicated DSP pipeline and a high-performance 12-bit ADC allow Microchip's PIC32MZ EF series of 32-bit MCUs to improve code density, decrease latency and accelerate performance in process-intensive applications.

The 48 devices in the PIC32MZ EF family also offer up to 2 MB of dual-panel Flash and up to 512 KB RAM. A live-update capability allows the Flash to be updated whilst the CPU is in operation. The family also offers a rich peripheral set and more connectivity options than any other PIC32 MCU. These options include 10/100 Ethernet MAC, high-speed USB with PHY, high-speed SQL, and dual CAN ports.

In the LCCG configuration, the PIC32MZ EF family can drive WQVGA displays without the added cost of external graphics controllers. There is also support for high-throughput data encryption, decryption and authentication from the optional, full-featured hardware crypto engine with true random number generator.



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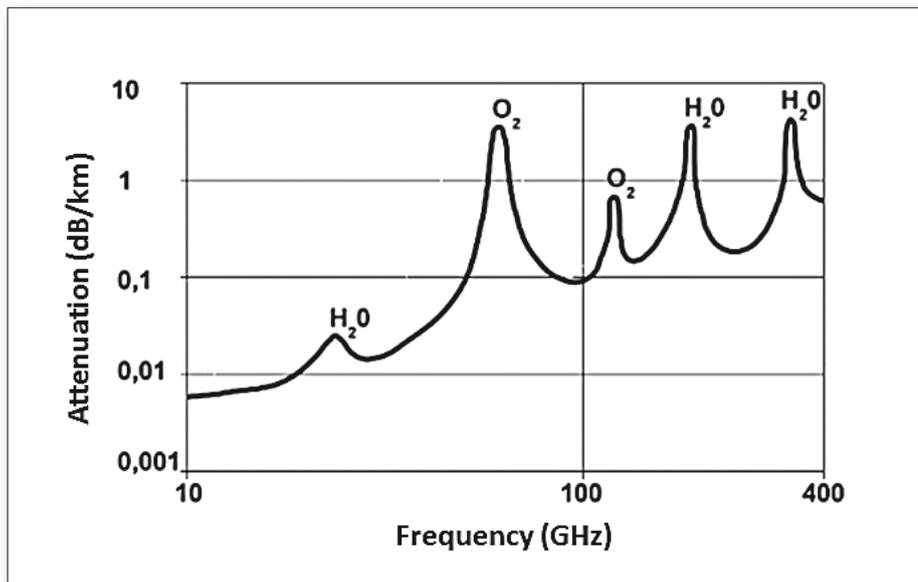


Figure 2. Attenuation dips between about 70 and 100GHz, increasing achievable communication range. (Source: [https://commons.wikimedia.org/wiki/ File:Microwavattrp.png](https://commons.wikimedia.org/wiki/File:Microwavattrp.png))

Application	Detection range (m)	Operating frequency (GHz)
Adaptive cruise control	200	77
Pre-crash	30	24, 76, 77, 81
Blind spot detection	20	24
Stop and go	30	24, 76, 77, 81

Table 1. Vehicular radar applications and operating frequencies

Low power levels plus advances in semiconductor fabrication now allow a complete radar transceiver to be formed with only a few devices. A typical radar module consists of a transmitter, voltage-controlled oscillator (VCO), and receiver ICs, along with a micro-controller unit (MCU). The chips are connected via a local oscillator operating at about 38GHz. Together these devices can provide a complete radar solution for adaptive cruise control, emergency braking, lane departure warning and blind-spot detection systems that consume power efficiently.

The list of specific auto safety functions, each with its own acronym, that require some type of sensor or sensors is long and growing, which makes sorting them out confusing at best. Collectively they're grouped under the term Advanced Driver Assistance Systems (ADAS) that includes everything from collision avoidance to lane departure and blind spot warning, and backup cameras to systems designed to detect the awareness of the driver (or lack thereof), to name only a few. Some types merely detect impending doom but others are designed to prevent it, much like some systems used in commercial aviation. Ironically, as auto safety systems increasingly rely on radar, the next generation of aviation safety systems will not, using satellite navigation instead. One by one, many auto safety functions will become mandatory in vehicles

as their performance and value is demonstrated. For example, the National Highway Traffic Safety Administration (NHTSA) recently ruled that all vehicles weighing less than 5 tons and built after May 2018 must have backup cameras. Progress in this area will be simultaneous with development of autonomous vehicles that will rely on all sorts of sensor-based systems to provide situational awareness, collision avoidance, and many other functions.

One of the least developed but critical elements necessary to make autonomous vehicles a reality is their ability to communicate with other vehicles and to networks such as Wi-Fi and cellular systems. No type of sensor, RF or optical, has the range or field of view needed to locate the car you're riding in from ten cars ahead or behind, so vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) systems will be essential to achieving true autonomy. In a V2V system, two or more vehicles that are within acceptable communication range automatically establish a connection to form an ad-hoc network. They can then transmit and receive data about their location, speed, and direction. As this type of network allows all participants to act as routers, they can connect with other vehicles further away. The overall system must be able to make rapid decisions automatically so that timely warnings can be created and sent.

V2I expands the range and type of data that can be included to decision-making purposes by incorporating a broad array of infrastructure into the mix, gathering data about traffic and road conditions and recommending specific actions that vehicles in specific areas should take. This can presumably also reduce emissions and fuel consumption. These recommendations could be offered to drivers via their information panels or by external signs or both. In an ideal scenario, these suggestions would turn into actions taken not by the driver but by the car, up to a point defined by the Vienna Convention on Road Traffic.

V2V systems have been designated to operate between 5.85 and 5.925GHz, which was set aside by Congress for this purpose and has been harmonized with the EU and elsewhere. Although various communication standards have been proposed, the most likely will be an IEEE 802.11 variant called IEEE 802.11p that is designed to meet the criteria of Intelligent Transportation Systems (ITS). In particular, since a moving vehicle and roadside infrastructure may be able to communicate for a very short time, IEEE 802.11p makes it possible to exchange data without first being authenticated. Rather, transmission and reception can begin as soon as they are detected. As this varies from standard IEEE 802.11 protocol, the new "p" variant was required. The variant is part of IEEE 1609 Family of Standards for Wireless Access in Vehicular Environments (WAVE), which defines the architecture, communications model, management structure, security mechanisms, and physical access for low-latency communication up to 27Mb/s over ranges up to 1000m.

Every vehicle manufacturer is actively working to bring V2V to fruition and numerous consortia have been created to ensure progress in a more or less coherent way. Toyota, for one, has committed to having some of its models V2I-enabled as an option this year in Japan, compatible with advanced vehicle-infrastructure cooperative systems that operate at the Intelligent Transportation System (ITS) frequency. While industry-wide compatible systems may seem a long way away, the intensive development taking place in this industry along with efforts by NHTSA, the Department of Transportation, and similar agencies throughout the world to create a set of standards are shrinking this timeline. In fact, it is possible that manufacturers may be required to deploy V2V systems in the U.S. by 2017. NHTSA has stated that it believes this technology could reduce accidents by as much as 80%.

The scope of the ITS is ambitious, considering all of the data, cars, infrastructure, and new technology involved. However, the technological sophistication of modern vehicles is

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somewhat astonishing considering that the carburettor was invented in 1876 and wasn't widely phased out until the late 1990s. Jerry Maldonado, vice president of automation, customer lifecycle solutions at CA Technologies, put this in perspective in a company blog. According to Maldonado, a luxury car today has about 100 individual microprocessors and even a relatively modest one has 25 to 30, including the dreaded event recorder that verifies how you were operating your vehicle when it crashed. He also compiled an estimate of the lines of code they employ, comparing this with other data-intensive platforms. An F-22 fighter by his estimates has 12 million lines of code, the flight software in a Boeing 787 Dreamliner has 15 million lines, and the Android operating system has 12 million. A Chevrolet Volt has 12 million. In short, nowadays most complex vehicles are formidable mobile computing platforms whose computational assets will increase as the number of parameters gathered by V2V and V2I are added in coming years.

A considerable portion of this information will come from disparate sources ranging from on-board and external cameras, to sensors in the pavement, and other sources that have not been developed yet. Everything from traffic lights to railroad crossings and pedes-

trians will be discernable to these systems. Within this information will be data gathered by radar sensors whose number will likely increase, thanks to a radar ability to provide precision information about the host vehicle as well as those to its front, side, and back.

Ubiquitous though radar systems may be, they are not the only RF and microwave systems that will be essential in and out of the autonomous vehicle; massive amounts of data captured by the connected car will arrive by means of Wi-Fi or cellular systems. The autonomous vehicle and all the external systems that enable it to function not only provide information about a vehicle, they allow connection to other vehicles, roadside infrastructure, and the Web. The possibilities of what can be done with such data on a massive scale are enticing with respect not only to traffic management and law enforcement, but on a grander scale of economics as someday vehicular traffic will be precisely quantifiable enough to forecast consumption, population behaviour, and other presently intangible attributes of society on a near real-time basis. As the world reels from a string of breaches and massive data collection by intelligence agencies, security is getting increased attention in automotive circles. It is becoming increasingly obvious that no matter how secure companies and government agen-

cies attempt to be, someone will ultimately find a way in. Once autonomous vehicles are plying the streets everywhere, more information about where we go, what we do, what we buy, and whether we travel within the scope of what is deemed to be sensible will be available for analysis. And it will likely be available to hackers, as well. Alongside this issue is whether or not most people will like having some unseen entity guiding how they drive and where. All the same, the economic result of much safer and autonomous vehicles will save many lives and billions of dollars in prevented accidents. It is also a massive new market for some sectors of the RF and microwave industry. Every vehicle will have multiple radars, become its own Wi-Fi hotspot perhaps along with cellular capability, and huge numbers of radar and optical sensors will be mounted on so-called street furniture such as benches and the like; all connected without wires. This together with the ubiquity of IoT devices will ensure the health of the RF wireless industry as far into the future as anyone is likely to guess. ■

For further information, visit the Mouser Application & Technologies section at: www.mouser.com/applications.

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Embedded World News

Hall-Stand 4-173

● **Renesas: RX230 MCUs support cost-sensitive industrial and consumer applications**

The new RX230 Group of 32-bit microcontrollers from Renesas offers an optimal combination of high performance with digital signal processing and floating point unit, and low power consumption. With 1.8V to 5.5V supply, the RX230 Group is ideal for applications that require high processing performance in environments with low current supply capacity – a key requirement in several industrial and consumer applications – as well as the robustness needed in home appliance applications.

[News ID 3849](#)

Hall-Stand 2-110

● **Fujitsu Semiconductor Europe to become Fujitsu Electronics Europe**

Fujitsu Electronics Europe (FEEU) has entered the market as a new global distributor on 1 January 2016. Previously doing business as Fujitsu Semiconductor Europe (FSEU), the company now operates from offices in Langen (near Frankfurt), Munich, Milan, Budapest and Istanbul after changing its name and realigning its strategy. Focusing on more than just semiconductors, FEEU offers a broader

portfolio of complex electronics solutions plus consulting services targeting applications in the automotive, manufacturing and communications sectors.

[News ID 3841](#)

Hall-Stand 5-210

● **ept: COM Express connector system Colibri for 10+ Gbit/s applications**

Are you looking to speed up your COM Express application? Colibri connectors from ept deliver first-rate signal integrity even at 10 Gbps, making the COM Express connector system the top choice for your applications at these speeds and higher. They are ideal for PCI Express Gen3 applications with 8 Gbps or 10 Gbps Ethernet (10GBase-KR). S-parameters are available on request from ept for use in simulating your proprietary designs. The Colibri connector system stands out due to its rugged design and flexible usability. Both 220-pin and 440-pin versions for board-to-board distances of 5 and 8 mm are available. Colibri is a double-row connector system consisting of a plug and a receptacle, each of which has a pitch dimension of 0.5 millimeters. They are processed using SMT technology, in other words, soldered directly on the circuit board. Colibri single connectors feature 220 pins.

[News ID 3828](#)

Hall-Stand 1-534

● **Swissbit: newly introduced flash memory cards and storage families at embedded world 2016**

Swissbit will be exhibiting a number of new products at embedded world that address the needs of industrial, automotive and networking/communications applications. Items highlighted will include SD and microSD cards, embedded USB modules and solid state drives. The event will also signify the first appearance of Swissbit's durabit range, which delivers an unprecedented combination of performance and endurance in MLC NAND flash based memory and storage products.

[News ID 3782](#)

Hall-Stand 5-360

● **Infineon: OPTIGA TPM chips protect latest Microsoft Surface devices**

Microsoft puts emphasis on hardware based security to protect sensitive user data stored on connected devices. The company integrates OPTIGA TPMs (Trusted Platform Modules) from Infineon into its latest personal computing devices. Among these are the new Surface Pro 4 tablet and the Surface Book, the first Microsoft branded laptop.

[News ID 3816](#)

Firmware protection for MCUs enables security in IoT applications

By Marco Blume, Wibu-Systems, and Dirk Heinen, Infineon Technologies

Microcontroller-based systems in IoT applications require a high level of data security and functional safety. The solution presented here ensures both a secure firmware update as well as secure functional upgrades for XMC4000 microcontrollers. Also, it supports the simple implementation of functional safety.



Figure 1. Networked systems in IoT designs have numerous points of exposure for attacks and manipulation. Secure firmware updates and functional extensions to microcontroller-based systems are a basic requirement for ensuring data security in IoT applications.

■ The outlook for IoT applications is impressive. The Internet of Things should make roughly a 15 trillion US dollar contribution to the global gross social product in the next twenty years (source: General Electric), with an installed base of 28.1 billion units by 2020 (source: IDC). But these figures are not only impressive, but simultaneously alarming when one considers the security aspects associated with the IoT revolution. It is important to take advantage of these developments while still ensuring both functional safety and data security. Security aspects affect all the systems involved, from PCs, IPCs, embedded systems, mobile devices, and PLCs to the microcontrollers used. Wibu-Systems, working with Infineon, has now introduced the CodeMeter μ Embedded, an efficient firmware protection for systems based on the XMC4000 microcontroller, in particular in applications such as IoT or Industry 4.0.

The Internet of Things (IoT), with its different variants such as Industry 4.0, information and communications technology, smart homes, and networked automobiles, requires a high level of security. Typical application cases include the authentication or licensing of components based on their unique identity, monitoring and securing system integrity, the protection of data and communications, as well as secure updates and upgrades. To

build trust in new services and technologies, IP protection is also essential. Corresponding solution concepts require embedded system solutions based on secure hardware that protects the infrastructure and components from attacks, fraud, and sabotage. Since essentially all embedded systems integrated into IoT concepts are based on microcontrollers, this is the first level on which the corresponding protective functions must rely.

The general challenge in the implementation of maximum security in microcontroller applications lies in the fact that the solution must also be usable under harsh industrial conditions and easy to integrate. CodeMeter μ Embedded was developed based on the proven CodeMeter solution for the protection, licensing, and security of systems. It particularly addresses the security aspects of firmware updates and functional extensions of microcontroller-based systems. The corresponding keywords here are code integrity, license monitoring, and protection from reverse engineering and copying of program code. The implementation of CodeMeter μ Embedded was carried out in collaboration with Infineon and is based on the 32-bit microcontroller family XMC4000. CodeMeter μ Embedded extends the standard development tools to provide secure firmware updates and functional extensions in embed-

ded systems based on the XMC4000. Microcontrollers are increasingly used in frequently networked applications such as pumps, motor drives, sensors with field bus connections, and similar systems. In these applications, the secure loading of updates and/or functional upgrades is a significant security-critical aspect. The task of CodeMeter μ Embedded is to ensure secure loading of updates into the XMC4000 microcontroller and to introduce new functionality even in insecure environments. In highly networked and intelligent systems such as those in IoT, these important following aspects must be considered. Only trustworthy code may be loaded into the controller. The code must be encrypted during transmission and loading. This is done using a unique key stored in the boot ROM of the controller. Traceable, reliable licensing must also be guaranteed while loading the code onto the controller. It should be possible to block or activate additional functionality of the microcontroller. The code may only be loaded and decrypted on authorized (licensed) controllers. It is essential to ensure that use on an unlicensed controller or emulator is prevented.

CodeMeter μ Embedded protects the firmware of the controller against manipulation, reverse engineering, and copying during updates. OEMs that develop software for controllers

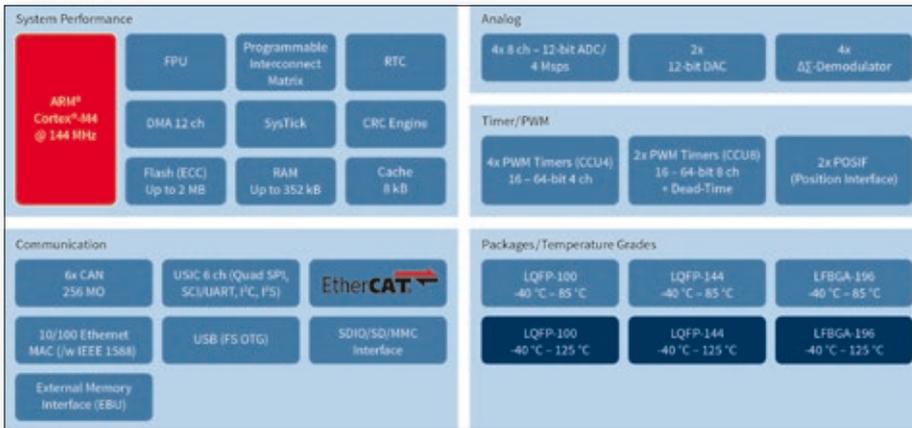


Figure 2. The 32-bit microcontrollers in the XMC4000 family offer appropriate performance and peripherals with powerful communications interfaces for use in IoT designs.

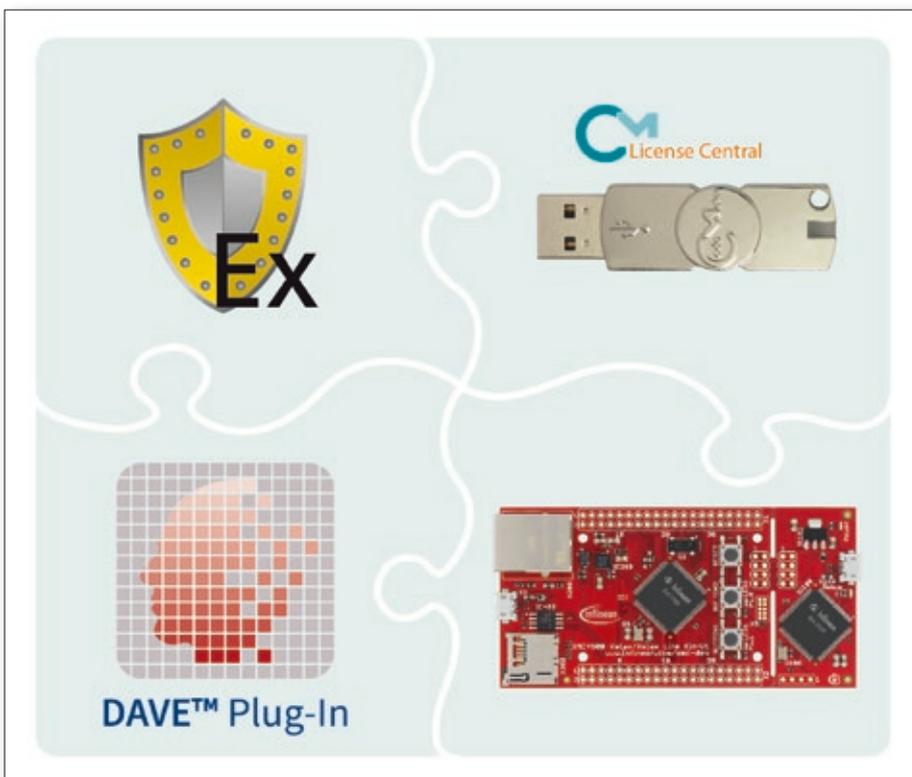


Figure 3. CodeMeter μEmbedded permits efficient firmware protection for systems based on XMC4000 microcontrollers. Secure functional upgrades to the XMC4000 microcontroller are also provided.

can also extend system functionality. The user can load a new encrypted firmware version from an external environment into the controller. This triggers encryption through the development environment – such as DAVE 4.0 from Infineon. Therefore, an appropriate plug-in is installed in DAVE. DAVE Version 4 is available for download as a free development tool. This professional Eclipse-based

development platform supports the user in developing software, from evaluation to final product. Among other things, an extensive peripheral- and application-oriented, component-based code repository is available. DAVE also generates appropriate code for the peripherals of XMC microcontrollers. With DAVE, the user can take advantage of commercial third-party tools for ARM to translate,

link, and load the C source code configured and generated in DAVE onto the MCU. That covers the entire development cycle from evaluation to first prototype to final product, giving users maximum freedom in fast, efficient, platform-oriented software and product development. After transfer to the XMC4000 microcontroller, the firmware is decrypted and stored in the flash memory. The XMC4000 handles the decoding. The microcontroller can generate a request with its unique fingerprint for later upgrades. This encrypted request is then transmitted to the manufacturer, who generates an appropriately licensed update and sends it back. The licensing update transmitted to the microcontroller can be used to provide new licenses or new functionality. The integration of this solution into DAVE as a plug-in permits its use in a variety of application cases based on a technology or development environment with efficient firmware protection. Functional upgrades can be carried out without changes to the firmware, while secure firmware updates are possible even in insecure environments. The solution is also easy to handle and customer-friendly, while using the latest in encryption technology.

CodeMeter μEmbedded is a security variant specifically developed for Field Programmable Gate Arrays (FPGAs) and microcontrollers. The software is characterized by extremely small space requirements (footprint) of less than 60 Kbytes. This was achieved by reducing the functional scope of the solution to the absolute minimum. The licenses generated are compatible with any CodeMeter variants. Each license is bound to a unique ID of the FPGS or microcontroller. Licenses can be activated in the production environment directly during production, or afterwards by file exchange in a features-on-demand system.

CodeMeter μEmbedded can also be used for the secure storage of symmetric and asymmetric keys. The key material is placed in protected storage and can be used only on a device with the correct ID. Typical application cases include: license control on devices (microcontrollers and FPGAs), monitoring of production quantity by licensing of individual devices, and the secure encrypted transmission of application code to the device. With CodeMeter μEmbedded, customers on the microcontroller family XMC4000, that uses the ARM Cortex M4 processor, get a secure solution for updating the firmware on embedded systems already installed in the field, or to

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activate licensing of additional functionality. CodeMeter μ Embedded is compatible with CodeMeter, the security solution for PCs and embedded devices. So, one can continue to use familiar tools, such as CodeMeter License Central and the development environment DAVE. A new plug-in for DAVE offers developers a simple graphical interface for configuring the XMC4000 microcontroller and generating encrypted firmware updates or license files.

The XMC4000 family for industrial applications is particularly well-suited for digital power converters, electrical drive trains, and sensor applications; it supports a variety of industrial communications standards. All XMC4000 microcontrollers are qualified for temperatures up to 125°C. They use the ARM Cortex M4 processor with built-in DSP functionality, floating point unit, Direct Memory Access (DMA), and Memory Protection Unit (MPU). The extensive peripherals include analog/mixed signal converters, high-resolution timers/PWM channels, and interfaces for all current industrial communication standards. The XMC4000 family today consists of the seven series XMC4100, XMC4200, XMC4400, XMC4500 and XMC4700 as well as XMC 4300 and XMC4800. It includes more than 80 components in VQFN, LQFN, and LFBGA packages with between 48 and 196 pins. The two series XMC4300 and XMC4800 feature on-chip EtherCAT (Ethernet for Control Automation Technology) and permit the simple, cost-effective implementation of real-time Ethernet communications and is therefore ideal for Industry 4.0 applications.

In addition to data security, of course, complex IoT applications must also ensure functional safety – and that is even more important in networked systems. However, the implementation is often difficult. For industrial applications that must meet functional safety requirements, there is a Safety Package available for the XMC4000 family. It helps in the development of TÜV-certified automation systems that must meet the requirements of Safety Integrity Levels SIL 2 and SIL 3. Also, the Safety Package assists to reduce the development time of functional safety software test libraries to just a year. It was developed for factory automation, industrial drives, and robotics applications, as well as in consideration of Industry 4.0 and IoT. The XMC4000 Safety Package includes the XMC4000 microcontrollers and also a detailed set of documentation and a TÜV-certified software test library. The documentation includes an error mode report and a failure mode effects and diagnostic analysis (FMEDA) report, as well as the Safety Application Note. The FMEDA uses reliable FIT (failure in time) rates for the XMC4000 microcontroller. ■

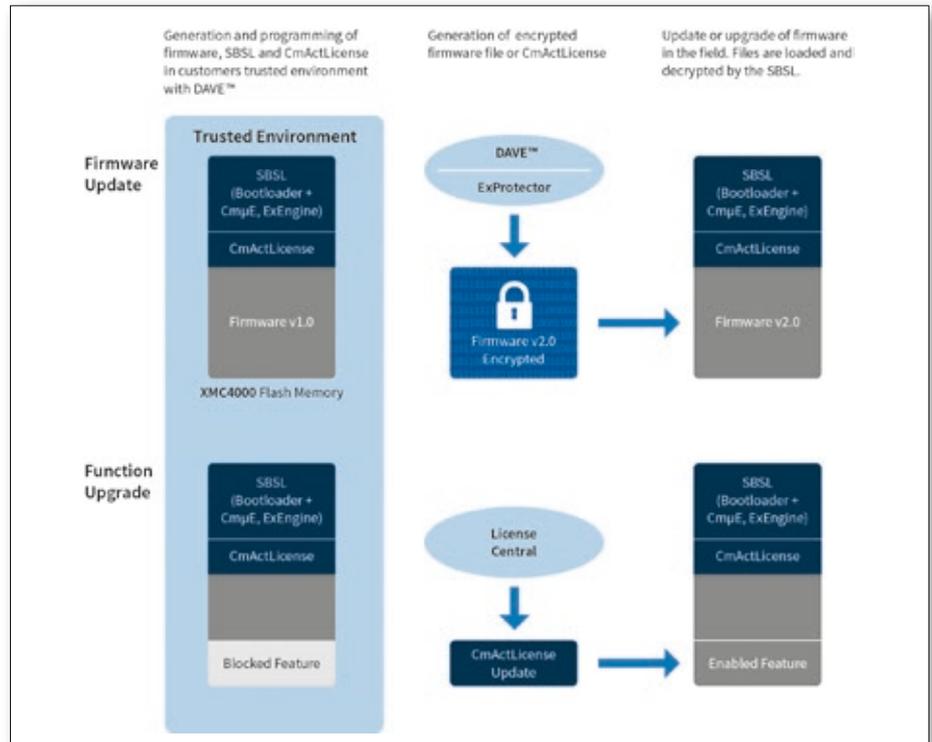
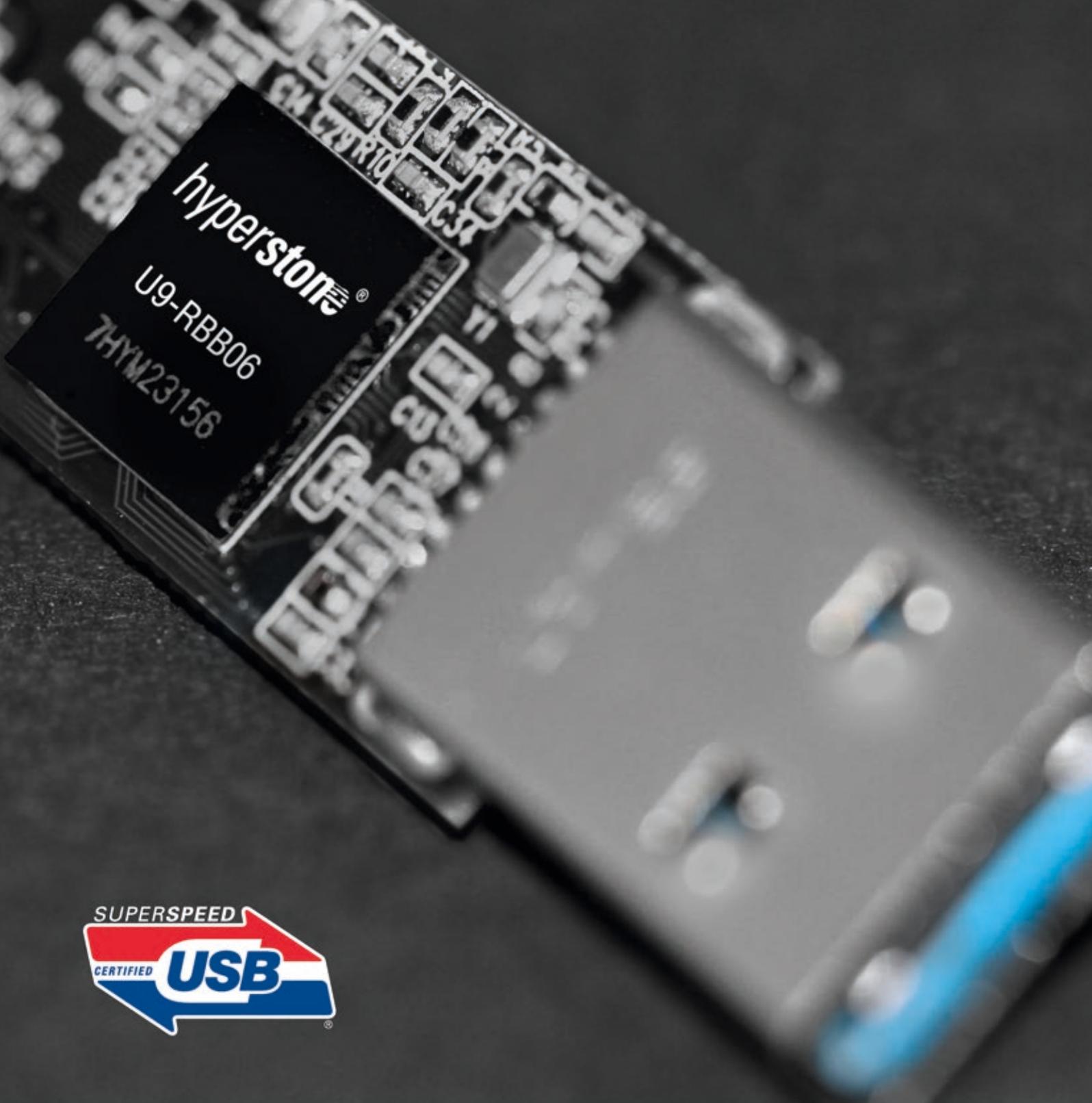


Figure 4. Complete development environment with embedded security: a new plug-in for the DAVE development environment offers developers a simple graphical interface for configuring the XMC4000 microcontroller and generating encrypted firmware updates or license files.

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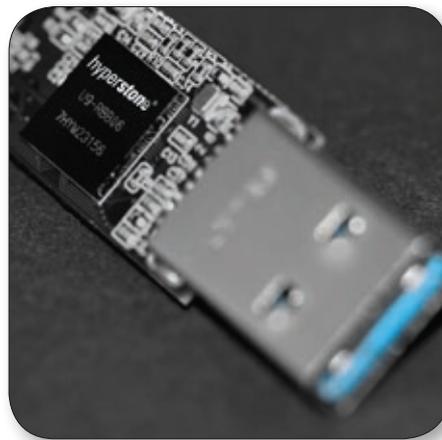
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USB 3.1 SuperSpeed flash drives for industrial/embedded applications

By Damien Col, Hyperstone

This article introduces the new U9 USB 3.1 NAND Flash Controller combining USB SuperSpeed with power-fail robustness and reliability for industrial applications. It takes full advantage of the increased host interface performance, without any trade-off on the durability and reliability of the solution.



■ In terms of removable flash storage, USB is one of the most popular protocols and USB drives are widely used in consumer markets. Recently, USB is also gaining popularity in industrial applications. Based on a certified interface it shows little field compatibility issues and establishes a fairly robust connection compared to some other interfaces. Where Compact Flash (CF) has been the leading and very reliable interface in the past years, USB is gaining ground, not only as a removable form factor, but especially as embedded USB module or directly soldered on a PCB as disk-on-board solution.

Besides reliability and data retention, read/write speeds are becoming more important. USB 2.0 solutions might not offer sufficient performances. Also notably, access pattern have great impact on flash system lifetime and consumer graded products may fail in the field. In-car infotainment, gaming or network communications, for example, are fields of application, which require fairly high transfer rates and very low read latency.

To address the requirements of these markets, Hyperstone is presenting its updated product line of NAND flash controllers. With USB 2.0, the system bottleneck was the USB interface for a flash system rather than the NAND flash interface. U9 is the latest Hyperstone USB con-

troller adopting USB 3.1 Gen 1 (SuperSpeed 5 Gbps). With 2 NAND flash channels and up to 8 chip enables, it reaches sequential write performance of up to 150 MBps, and sequential read performance of up to 200 MBps. It benefits from the hyReliability flash management features already implemented on previous Hyperstone designs as well as from the latest hyMap technology for higher random write performances and increased endurance. Hyperstone is also in the process of providing an Application Programmers Interface (API) and library enabling its customers to develop their own value-added differentiators and proprietary firmware extensions.

U9 architecture follows a long line of flash memory controller designs developed by Hyperstone targeting industrial and embedded markets. Around an AHB bus and its own 32-bit RISC processor, it includes: USB 2.1 and 3.1 Gen 1 device interface and dedicated PHYs including 2 channels NAND flash interface comprised of: Direct Flash Access (DFA) control co-processor, Flexible Error Correction Coding (ECC up to 96-bits/1KB), AES on-the-fly encryption/decryption engine, and dedicated page buffers for each channels. A number of additional interfaces using a bank of GPIOs (I2C, SPI, GPIO) is also integrated. USB 3.1 Gen1 can be confusing, but this is the official name. However, it was more

commonly known as USB 3.0 (5 Gbps interface). Due to various NAND flash technologies (SLC, MLC, TLC, 3D NAND...) different requirements in terms of flash handling are necessary. While process geometries are getting smaller to reduce flash cost, data retention of data stored and endurance in terms of write/erase cycles are getting worse. Over the last years, customers enjoyed continuous cost reductions regarding USD/GByte but as flash memory vendors approach process limitations, reliability is pushed to the limits. In demanding markets, reliability, and power-fail safety are issues to be taken care of since there is a higher cost of non-conformance.

Power fail safety is a key issue for systems requiring reliable data storage but facing unpredictable power downs or being hot-plugged. If the storage media is used to store code, cost of being offline or requiring unscheduled service should be considered. Unlike most SSD controllers, offering comparable performance and endurance, Hyperstone controllers do not require external memory components to store mapping data and FTL metadata. Protecting external DRAM against power-fail requires additional power back-ups such as battery or supercaps in order to save management data when a sudden power-fail occurs. Aside of cost, such components also add to quality, wear-out and endurance weaknesses.

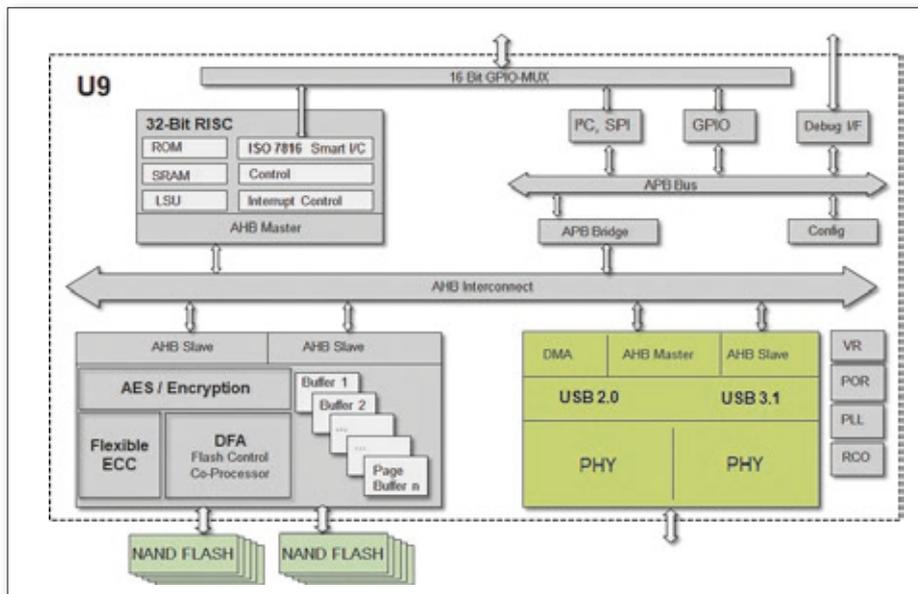


Figure 1. Hyperstone U9 - USB 3.1 Block Diagram

Characteristics	Enhanced SuperSpeed USB	USB 2.0
Data Rate	Gen 1 (5.0 Gbps), Gen 2 (10 Gbps)	Low speed (1.5 Mbps) Full speed (12 Mbps) High speed (480 Mbps)
Data Interface	Dual-simplex, four-wire differential signaling separate from USB 2.0 signaling Simultaneous bi-directional data flows	Half-duplex two-wire differential signaling Unidirectional data flow with negotiated directional bus transition
Cable Signal Count	Six: Four for Enhanced SuperSpeed data path, two for USB 2.0	Two: Two for low-speed/full-speed/high-speed (USB 2.0) data path
Bus Transaction Protocol	Host directed, asynchronous traffic flow Packet traffic is explicitly routed	Host directed, polled traffic flow Packet traffic is broadcast to all devices
Port State	Port hardware detects connect events and brings the port into operational state ready for Enhanced SuperSpeed data communication	Port hardware detects connect events. System software uses port commands to transition the port into an enabled state
Data Transfer Types	USB 2.0 types with Enhanced SuperSpeed constraints. Bulk has streams capability	Four data transfer types: control, bulk, interrupt, and isochronous

Table 1. Comparing USB 3.1 to USB 2.0
(Source: Universal Serial Bus 3.1 Specification, Rev. 1.0, July 26, 2013, chapter 3.1.4)

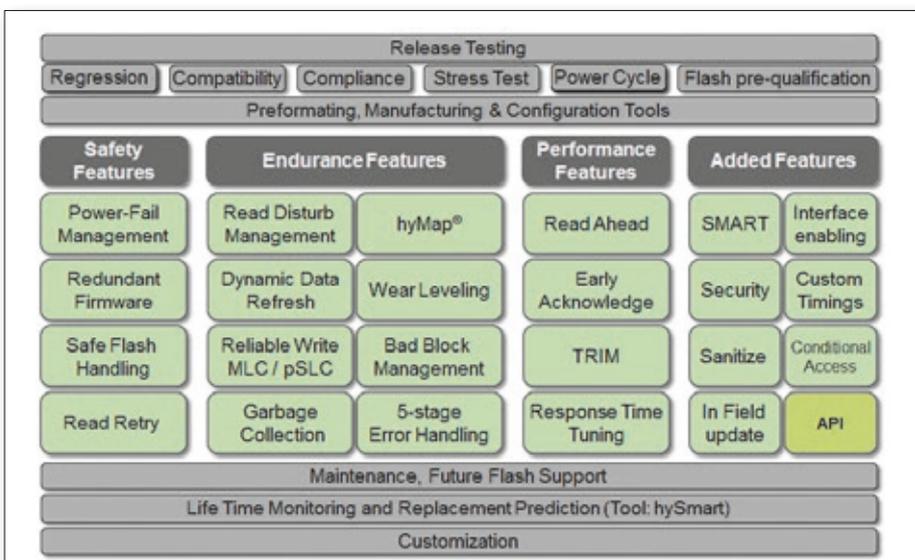


Figure 2. Hyperstone hyReliability firmware features API and Security.

Depending on the flash generation, flashes require a certain number of bits to be correctable by the controller. U9 corrects up to 96 bit errors per 1KB data unit. During Read, the ECC information is used to identify decreasing data quality, wrong bits are corrected and flawless information is sent to the host. As soon as a certain threshold of bits that need to be corrected is reached, the entire block is refreshed immediately after error correction and without impacting the overall device performance. This so-called Near-Miss ECC feature is standard in the U9.

Bit errors occur for several different physical reasons: Data retention and program disturb are most common but more recent flashes also need to be protected against read disturbs. Therefore, Hyperstone developed an algorithm (threshold and triggers can be defined by vendors) that frequently checks the data of the entire flash system. Depending on error patterns, individual blocks, areas, or the entire system is refreshed. The U9 firmware analyses the error pattern in order to optimally refresh data without unnecessary performance or wear-out impact. This ensures longest lifetime, data integrity and reliability of the device. For the unusual case that the ECC is not able to correct errors in the data read from a flash, Read Retry is applied. With this function it is possible to recover data by repeating reads on the same cells but with different flash threshold setups. Reading with dynamic read thresholds can dramatically increase flash endurance.

5-stage error handling describes a combination of single features of the U9 to make the flash drive as safe as possible. It therefore combines the basic error correction with additional features like Near-Miss ECC, Dynamic Data Refresh, Read Retry and additional CRC (cyclic redundancy check) protection. The process of the error handling is optimized in a way that: 1) Standard ECC corrects up to 96 bits depending on flash requirements; 2) Near Miss ECC identifies a certain level of errors; 3) Data on the flash is refreshed by the controller and correct data is ensured by double-checking with a CRC check; 4) If the number of errors is greater than the maximum capacity of the ECC, Read Retry is started; 5) To cope with extreme read intensive situations, which may have negative influence on the flash, Dynamic Data Refresh is used to refresh data based on the actual error situation on the whole drive.

The U9 feature Device Health Data - SMART allows users to retrieve data about the health status of the drive. Important parameters related to wear-out or erase cycles, bit error occurrences, read counts etc explain the current health situation on the drive. It gives clear indications whether immediate actions are required or not. This allows the user to run



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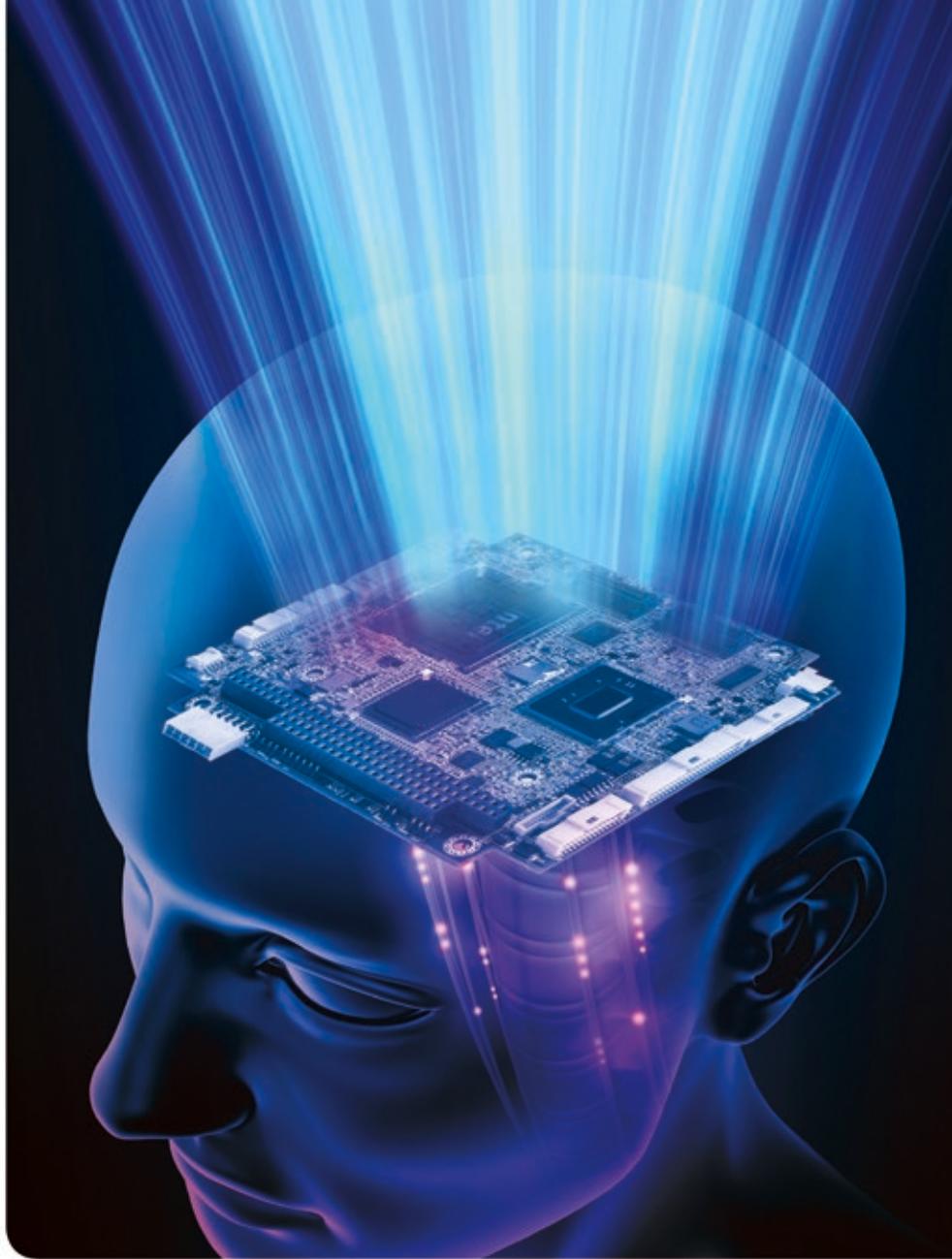


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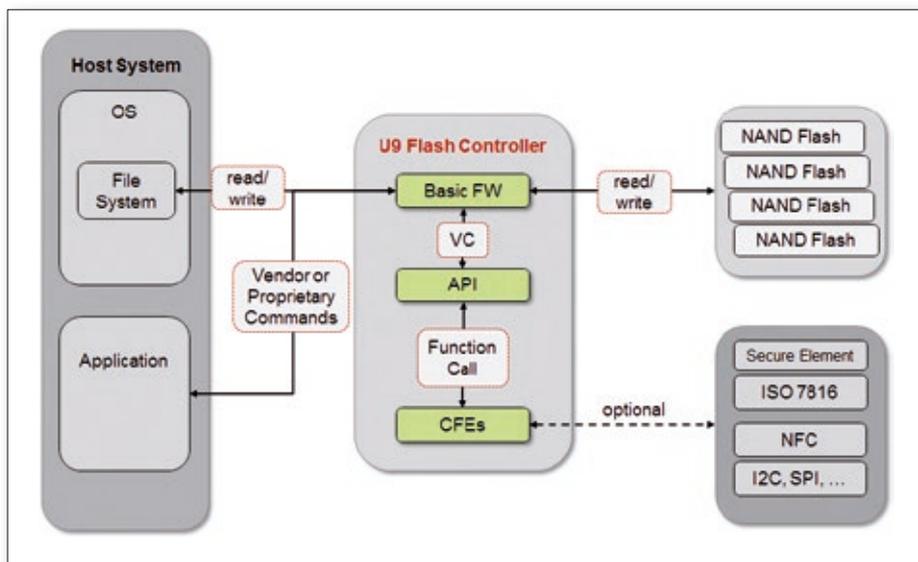


Figure 3. API Block Diagram

	eMMC4.5	SD 2.0/ 3.0	USB 2.0/3.1	CF/PATA	SATA
Typ. Capacity Range	16 – 128 GB	1 – 64 GB	8 to 128 GB	128 MB -64 GB	128+ GB
Typ. Flash Technology	MLC	SLC - industrial MLC - automotive TLC - consumer	SLC - industrial MLC - automotive TLC - consumer	SLC	MLC TLC
Typ. Performance Range (seq. write)	40 to 100 MB/s	10 to 60 MB/s	30 to 200 MB/s	15 to 60 MB/s	150 to 300 MB/s
Typ. Form Factors	BGA	SD/microSD card	USB stick eUSB module	CF card	M.2, MO-297, SSD, CFast
Requires external DRAM	No	No	No	No	Yes
Power Consumption	Low	Low	Low	Low	High
Industrial Support	Poor	Good	Good	Good	Average
Command Protocol	eMMC	SD	SCSI	ATA	ATA
Removable	No	Yes	Yes	Yes	No*

Table 2. Comparison of selected flash storage for removable and embedded flash media
(* except for CFAST)

the flash drive as close as possible or acceptable to the end of the lifetime and to integrate health information into own service plans. Hyperstone flash memory controllers contain dedicated firmware (hyMap) to handle the flash memory. Above and beyond a bridge

between a disk interface and a flash memory interface, it is the key element for managing the flash media in order to ensure and maximize its performance, reliability, robustness and endurance. Based on a new development, customers and storage system vendors are

enabled to integrate their own proprietary IPs, which may become key product differentiators. The Application Programming Interface (API) provides a possibility to extend the standard firmware and add own additional features to handle other sensitive aspects of the application (for example security features), through a set of routines, protocols and tools. It allows adding customer firmware extensions (CFE) to an existent Hyperstone firmware implementation. This is done by building (compiling and linking) an independent binary file, which is able to communicate with a host software and with the basic flash firmware.

Custom applications can be developed independently of the Flash Memory controller firmware. As a result, the CFE will be part of the firmware code and will be integrated alongside the other firmware features. The API can be used to provide access to additional hardware interfaces through the host interface in order to implement customized application features. The source code can be changed individually, always belongs to the user and does not need to be transferred to Hyperstone for compilation. The key advantages for the customer can be summarized in the following set of added values: full control of application IPs, full control of releases, no source code transfer to third party houses, unique differentiator through application IPs, fast software development, API function support from Hyperstone, and Firmware Field Update (FFU).

The U9 USB 3.1 controller complements the Hyperstone product portfolio of Flash storage controllers as USB 3.1 is a suitably alternative to CF, SD, eMMC or SATA systems. Together with hyMap® - Hyperstone's Flash-Translation layer (FTL), and the hyReliability feature set, U9 optimally ensures and balances reliability, endurance and performances. Based on several configuration options, storage system integrators can decide about most suitable and most cost efficient Flash technologies and tune storage system behavior to application requirements. Finally, by offering an API, Hyperstone promotes a new feature and value added application development based on the existing flash support infrastructure and ecosystem. ■

Embedded World News

Hall-Stand 4A-101

Mouseer stocking Intel Celeron processor N3000 series

Mouser Electronics is shipping the Intel Celeron Processor N3000 Series, the next-generation Intel Architecture system-on-chip based on Intel's 14nm process technology. Formerly known as Braswell, these 64-bit processors integrate graphics, memory controller, and I/O interfaces into a single SoC solution that balances cost, performance, and power.

News ID 3796

Hall-Stand 5-385

TI: AutoTune technology dynamically tunes stepper motors

Texas Instruments enhanced its high-performance stepper motor-driver family with three new devices for 24-V stepper motors. Two devices offer TI's patented AutoTune technology to eliminate stepper motor tuning and two integrate current sensing to support differentiated 3D printers, robotics, factory automation equipment, currency-counting machines and more.

News ID 3800

Well prepared for the six major markets of the future

By Mike Santarini, Xilinx

This article explains that All Programmable technologies deliver software intelligence and hardware optimization to enable development of today's major emerging market trends.



Figure 1. Customers are leveraging All Programmable solutions to create innovations for the emerging markets of ADAS, Industrial IoT, video/vision, 5G wireless, SDN/VFV networks and cloud computing.

■ Six important emerging markets - video/vision, ADAS/autonomous vehicles, Industrial Internet of Things (IIoT), 5G wireless, SDN/NFV and cloud computing - will soon merge into an omni-interconnected network of networks that will have a far-reaching impact on the world we live in. This convergence of intelligent systems will enrich our lives with smart products that are manufactured in smart factories and driven to us safely in smart vehicles on the streets of smart cities - all interconnected by smart wired and wireless networks deploying services from the cloud. Xilinx varied customer base is leveraging its All Programmable devices and software-defined solutions to make these new markets and their convergence a reality. Over the course of the last 30 years, its customers have become the leaders and key innovators in all of these markets. Where Xilinx has played a growing role in each generation of the vision/video, ADAS, industrial, and wired and wireless communications segments, today its customers are placing All Programmable FPGAs, SoCs and 3D ICs at the core of the smarter technologies they are developing in these emerging segments. Customers are using Xilinx All Programmable FPGAs and SoCs in their vision platforms for real-time analytics to create ADAS (advanced driver assistance systems) systems with high-velocity object detection/recognition; clinically

precise imaging systems that help surgeons guide robotic instruments with pinpoint accuracy; and UAVs and surveillance systems that have instantaneous friend-vs-foe recognition and tracking. With the soon-to-arrive 16-nanometer Zynq UltraScale+ MPSoC boasting a total of seven onboard processing cores (quad-core ARM Cortex-A53, dual-core Cortex-R5 and a Mali GPU core), users will be able to create even more intelligent and highly integrated video systems, speeding up ADAS push toward autonomous vehicles and Industrial IoT drive to Industry 4.0 factories and smart-city infrastructure.

In the early 2000s, Xilinx added automotive-grade variants to its FPGA product portfolio. Ever since then, automotive customers have given its devices a growing role in their efforts to enrich the driving experience through electronics. The automotive industry has gone through a remarkable renaissance of quality, safety and reliability thanks to electronics. For many decades, automotive electronics largely consisted of wire harnesses connecting lights and radios to a battery and an alternator. Then, in the early 2000s, OEMs began using electronic control units to replace highly unreliable mechanical actuators. Every year since then, OEMs have added more advanced electronics to their vehicle lines. What's more, the development cycles for

bringing these innovations to consumers have shortened, thanks in large part to the wide use of All Programmable devices. Xilinx devices made their debut in automotive infotainment systems but are now making a definitive mark in ADAS.

Today, Zynq-7000 All Programmable SoC is fast becoming the de facto platform provider for advanced ADAS systems. Audi, Mercedes-Benz, BMW, Ford, Chrysler, Honda, Mazda, Nissan, Toyota, Acura and Volkswagen are among the OEMs using ZynqSoCs or other All Programmable devices in their ADAS systems. The ZynqSoC serves as a multicamera, multifeature driver assist platform, a high-resolution video and graphics platform, a vehicle networking and connectivity platform and an image-processing and recognition platform. Customers implement algorithms for the most complex and compute-intensive functions of their design in the logic portion of the ZynqSoC and use the onboard ARM processing system for serial processing.

With its seven processors, the new Zynq-UltraScale+ MPSoC is destined to provide even more fuel for innovation as OEMs drive toward semi-autonomous and fully autonomous vehicles. With 64-bit application processors, real-time processors, a graphics

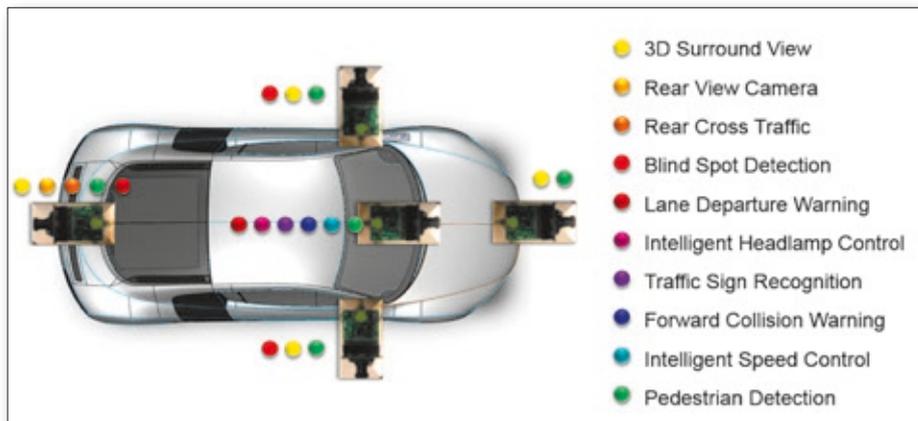


Figure 2. The sophistication of advanced driver assistance systems is rapidly evolving thanks in large part to customer use of Zynq-7000 All Programmable SoC devices to build fusion-sensor ADAS platforms.

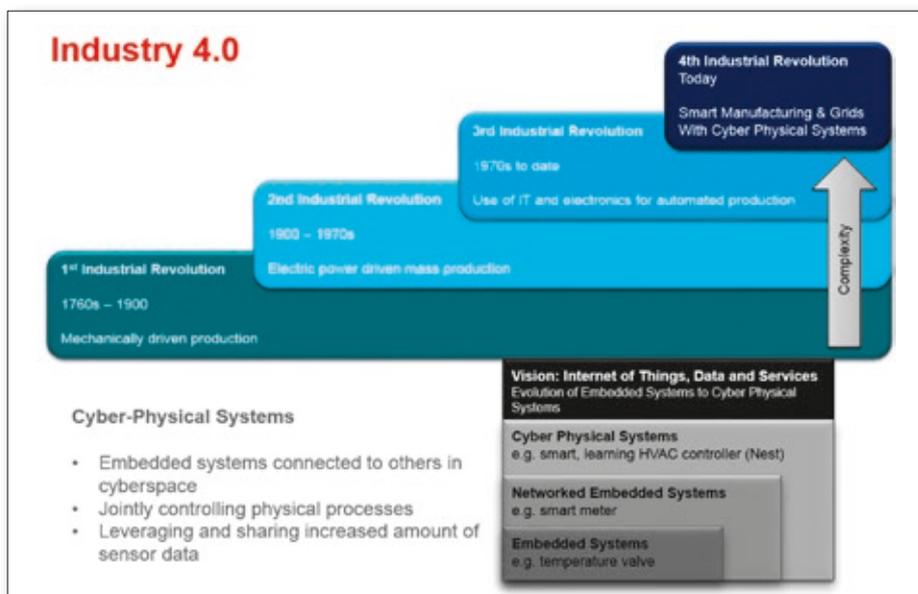


Figure 3. Industry 4.0 is the evolution from embedded systems to cyber-physical systems that, through advanced processing, enable smart manufacturing, infrastructure and cities. The result will likely be the world's fourth industrial revolution

processor, on-chip memory and FPGA logic all on the same device, OEMs can create ever-more-sophisticated fusion systems including V2V communications. What's more, IIoT smart infrastructure and smart cities can leverage these same ZynqMPSoC platforms for V2X. The innate programmability ensures the V2V and V2I networks will scale as the standards evolve and as more autonomous vehicles enter the roadways.

Customers in the industrial market have greatly advanced factory efficiency and safety over the last two decades using Xilinx devices. Today, with All Programmable FPGAs and SoCs, customers in all the major segments of IIoT are building secure and safe standards-compliant smart platforms with sensor fusion, smart motion/motor control and smarter and faster enterprise connectivity. These All Programmable platforms are

the underlying technology for smart wind farms composed of many smart wind turbines, each of which can adapt to changing weather conditions for maximum efficiency. The turbines are connected to control and enterprise systems that monitor wear and schedule preventative maintenance so as to avoid entire-system malfunctions.

With the greater capacity, functionality and processing clout of Ultra-Scale and UltraScale+ devices, IIoT customers will be able to advance these smart platforms even further, endowing them with greater intelligence for next-generation cyber-physical systems. With the seven processors of ZynqMPSoC, for example, customers will be able to integrate more sensor and motor/motion control functions into a single device and achieve real-time response not possible with any other ASSP-plus-FPGA configuration. The ZynqMPSoC on-chip

processing and logic will enable improved self-monitoring and diagnostics functionality. Equipment will employ self-healing algorithms or partial reconfiguration to optimize performance as machine conditions change or demand ebbs and flows. What's more, the ZynqUltraScale+ MPSoC can work in harmony with ZynqSoC-based systems.

In smart-city applications, companies can use ZynqSoC-based smart-sensor systems at the edge of the smart city surveillance network to enhance camera resolution and perform object detection and real-time threat analysis. Then, they can turn to the ZynqUltra-Scale+ MPSoC to synchronize the data received from each ZynqSoC-based smart sensor and communicate it accordingly with traffic control or authorities as threats, odd behavior, accidents or congestion are detected.

Likewise in the factory, in addition to being at the heart of cyber-physical systems, the ZynqUltraScale+ MPSoC can function as the macro controller of a factory network of ZynqSoC-based motor control, motion control and fusion factory-line quality and safety systems. Companies can leverage the seven processors to coordinate real-time response and analysis received from the ZynqSoC control system. At the same time, they can perform metadata analysis and communicate it with the enterprise through proprietary networks (in full compliance with safety and reliability standards) and through emerging high-speed 5G wireless and SDN/NFV wired networks.

Xilinx devices have played a significant role in every build out of the wireless and wired networking infrastructure since the 1980s. With every cycle of Moore's Law, its devices have grown in capacity and functionality to the point where nowadays All Programmable devices enable design teams to innovate new networking systems with the highest level of system programmability and differentiation ever seen. With 7 series 20nm UltraScale devices and upcoming 16nm UltraScale+ devices, Xilinx is enabling customers today to quickly bring to the market 5G and SDN/NFV infrastructure equipment with the highest degree of programmability. Its All Programmable FPGAs, SoCs and 3D ICs are the most flexible platforms for the evolving software and hardware requirements of 5G and SDN/NFV. Further, they are the well-suited programmable solution for the performance-per-watt demands of data center systems at the heart of the cloud computing business, poised to expand rapidly with 5G and SDN/NFV networking. In SDN/NFV, All Programmable technologies are enabling customers to build equipment with intrusion detection, load balancing and traffic management. Xilinx supports efficient management

and routing of data flows, a wide range of communication protocols and programmable data plane acceleration on demand. In 5G, customers are leveraging All Programmable devices to create distributed small cells, massive-MIMO systems with hundreds of antennas and platforms that perform centralized base band processing via Cloud-RAN. For data centers at the core of cloud computing, Xilinx devices enable companies to create equipment with maximum programmability and very high performance per watt that they can rapidly optimize for changing throughput, latency and power requirements from a wide range of applications such as machine learning, video transcoding, image and speech recognition, big-data analysis, Cloud-RAN and data center interconnect. With so many exciting technologies under development and certain to reach new levels of sophistication, autonomy and intelligence while all being interconnected, security measures will need to keep up.

With many decades playing in the mil/aero and security sectors, Xilinx provides physical security by means of anti-tamper technology to protect IP and sensitive data implemented on its devices from physical attacks. It also provides application security via fault-tolerant design, an implementation methodology that ensures the design can correct faults from propagating. Its devices and IP enable customers to implement several types of fault-tolerance techniques including real-time system monitoring, modular redundancy, watchdog alarms, segregation by safety level or classification, and isolation of test logic for safe removal. In a move that will enable all of these impending innovations in all of these many markets to come to fruition more rapidly, the company recently introduced its SDx development environments to ease the programming job.

The new products will bring the performance and programmability advantages of its devices to a far wider user base than ever before. By providing design entry via high-level languages, the SDx environments enable software engineers and system architects to program Xilinx devices with languages they are accustomed to using. Software engineers outnumber hardware engineers worldwide 10 to 1.

To enable further innovation in SDN, the new SDNet software-defined environment lets systems engineers build programmable data plane solutions with a high-level language to meet a unique network performance and latency requirements. To fuel further innovation in NFV and other network architectures and topologies, developers can use SDAccel environment, which enables system and software engineers to program the logic in Xilinx FPGAs in C, C++ and OpenCL to accelerate the performance of virtualized network functions (VNFs).

To enable further innovation in video/vision, ADAS/autonomous vehicles and IIoT applications that call for embedded processing, the SDSoC development environment allows software and system engineers to create entire systems in C++. They can optimize system performance by having the environment compiler implement slower functions in the ZynqSoC or MPSoC logic blocks. In this way, architects and software engineers can create systems with optimum performance and functionality that simply isn't achievable in two-chip platforms.

As we are fast approaching the milestone where video/vision, ADAS/autonomous vehicles, IIoT, 5G wireless, SDN/NFV and cloud computing converge, we are certain to see a number of innovations that will drastically change the society we live in - hopefully for the better. ■

Embedded World News

Hall-Stand 4A-341

HARTING: increasing demand for embedded and customised solutions

The HARTING Technology Group's embedded solutions are important components in the implementation of Industry 4.0. The demand for these solutions is growing steadily. "Embedded" means more than just "minimise" – far more, the incorporation of a very wide range of technologies and engineering competence into one market- or customer-oriented solution is what really matters. As a part of the HARTING Technology Group, HARTING Integrated Solution (HIS) draws on existing standards and components, but above all, on its know-how.

News ID 3861

Hall-Stand 2-541

Würth: digitalize your power supply

Würth Elektronik and Infineon are launching the jointly developed "XMC Digital Power Explorer" evaluation kit. This synchronous step-down converter, which can be assembled with two different control cards (XMC1300 - ARM Cortex-M0 MCU and XMC4200 - ARM Cortex-M4F MCU), makes it easier for developers of analog power supplies and embedded software programmers to enter the world of digital power supply. The XMC Digital Power Explorer Kit is a complete solution with hardware, software and switchable resistance load bank.

News ID 3803

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Hall-Stand 1-370

Maxim: power management chip optimizes power and battery life

With the MAX14720 power management integrated circuit from Maxim Integrated Products, designers can optimize power and battery life for wearable medical/fitness and Internet of Things applications. Increasing battery life and achieving low power are common challenges faced by engineers when developing wearable and IoT products. The MAX14720 PMIC is ideal for non-rechargeable battery (coin cell, dual alkaline) applications where size and energy efficiency are critical.

[News ID 3785](#)

Hall-Stand 4-340

home2net: easy and secure IoT access without gateway

home2net presents advanced and all new products for easy and secure cloud access and introduces software release 2.x to its web@ctrl family of Cloud connected I/O controllers. New features include support for DMX- and Modbus protocols as well as additional hardware support for PWM outputs, BLE (Bluetooth Low Energy) and WiFi functions. home2net adds a new, user-configurable APP to its proven ready-to-use infrastructure for smart cloud access. While the unique security concept enables quick and safe linking up to the cloud without any gateways or painful network configuration an all-new user configurable APP now enables local communication without a cloud connection.

[News ID 3712](#)

Hall-Stand 1-211

Innodisk releases DDR4 wide temperature module series

Innodisk introduces a DDR4 wide temperature module series designed for industrial platforms and applications for harsh environments. Supporting the Intel Skylake H/S/U and Broadwell platform, the DDR4 wide temperature module series is JEDEC compliant and offers up to 30% higher performance with 20% lower power consumption compared to the current mainstream DDR3 module. This product series is especially suited for outdoor environments. Its built-in thermal sensors alert the respective system to temperature changes, while its industrial-grade wide temperature components allow the operation to withstand temperatures ranging from -40 ~85°C.

[News ID 3773](#)

Hall-Stand 5-258

Arrow and Microsemi announce Arrow-Built SF2+ Development Kit

Arrow Electronics and Microsemi announced the latest addition to Arrow's growing portfolio of development tools: the Arrow-built SF2+ Development Kit, featuring Microsemi's SmartFusion2 SoC FPGA, Microsemi's Timberwolf audio processor and Microsemi's LX series power devices. The SF2+ Development Kit is ideal for both software and hardware engineers looking to jumpstart next-level integrated designs.

[News ID 3784](#)

Hall-Stand 4-173

Renesas: on-chip SRAM to enable real-time image processing

Renesas Electronics announced its successful development of a new dual-port on-chip static random access memory (SRAM) for in-vehicle infotainment system-on-chips in the 16 nm and later generations. The new SRAM is optimized for use as video buffer memory in automotive infotainment SoCs to realize the real-time image processing capabilities necessary for future autonomous-driving vehicle technologies. When testing the new SRAM in a state-of-the-art 16 nm process, it achieved both 688-picosecond high-speed operation under the low-voltage condition of 0.7 V and the high level integration density of 3.6 Mbit/mm².

[News ID 3741](#)

Hall-Stand 5-210

ept: simple and robust electrical and mechanical connection of PCBs

With its two new products flexilink b-t-b and flexilink jumper ept offers a simple and robust solution for connecting PCBs. Using traditional methods, it took several process steps to connect two boards to each other vertically. First, the connectors had to be soldered to both PCBs. Additional spacer pins for mechanical joining and secure fixation of the clearance were required when plugging the PCBs together. With ept flexilink b-t-b and the press-fit technology it provides, both PCBs are connected electrically and mechanically in just one process step. No additional screw connections are needed thanks to its high intrinsic stability. The electrical and mechanical connection is maintained even while molding the assembly. The assembly size and costs can be reduced in most any scenario.

[News ID 3603](#)

Hall-Stand 4A-101

Mouser: low-power digital humidity sensor from TI

Mouser is now stocking the HDC1050 low-power digital humidity sensor from Texas Instruments. Combining factory-calibrated humidity- and temperature-sensing elements, the HDC1050 device provides up to 14-bit measurement resolution and excellent accuracy at very low power. The Texas Instruments HDC1050 low-power digital humidity sensor, available from Mouser Electronics, is available in a 3 mm x 3 mm PWSON 6-pin DMB package, and provides high accuracy levels while consuming low power across a wide 2.7 – 5.5V operating voltage range.

[News ID 3693](#)

Hall-Stand 5-360

Infineon: driver IC family for mid- and low-voltage motor drives

Infineon Technologies expands its 200 V driver IC portfolio with the IRS2005(S, M) for high voltage, high speed IGBTs and power MOSFETs. The new driver IC features comprehensive protection for motor drive applications with stringent space constraints such as electric garden equipment, golf carts, power tools and mobility scooters. The IRS200x family consists of high-side & low-side and half bridge drivers utilizing Infineon's proven, robust high-voltage junction isolation technology to realize small packages while remaining tolerant to negative transient voltages.

[News ID 3733](#)

Hall-Stand 5-268

Toshiba: small package microcontroller with built-in pre-driver for motor control

Toshiba Electronics Europe has expanded its TX03 series of ARM Cortex-M3-based microcontrollers with the launch of the TMPM37AFSQG. The new IC is the world's smallest vector control microcontroller that incorporates Toshiba's Vector Engine Plus (VE+) coprocessor and a pre-driver to enable brushless DC motor control.

[News ID 3722](#)

Hall-Stand 1-610

IRISO: MXM2 connector qualified for Qseven Rev2.0/3.0 at PCI Express Gen3 speed

Along with its activities for the SGET, IRISO has got its long-term available MXM2 connectors qualified for suitability with the signal transmission speeds which come along with

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the third generation of PCI Express ("Gen3"). Simulations performed by EyeKnowHow have proofed that IRISO's MXM2 connectors are well suited for use in applications with data transfer speeds of up to 8 GT/s. Specifically, signal transmission in Qseven COM Carrier board scenarios (Device-Up and Device-Down) has been tested for PCI Express Gen3. While signal transmission in this speed range has been established in embedded systems for quite some time, so far none of the connector manufacturers had committed nor released the suitability for these speeds with their MXM2 connectors predominantly used in Qseven- and graphics systems. There are multiple benefits for the embedded community which come along with the qualification of IRISO's MXM2 connector at PCI Express Gen3 speed: In addition to connect Qseven modules to their respective carrier boards, IRISO's long-term available 230-pin connector can be used in the industrial and automotive sector for many other high speed applications. The high pin count of 230 and the low system costs of this edge connector make it a perfect fit for applications where many high speed signals have to be connected board-to-board, such as multimedia or graphics systems.

News ID 3863

Hall-Stand 5-385

TI: industrial drive control SoC to support digital and analog position sensors

Texas Instruments announced an on-chip solution supporting both analog and digital position sensors. The new TMS320F28379D and TMS320F28379S microcontrollers are an expansion to TI's C2000 Delfino MCU portfolio and, when combined with DesignDRIVE Position Manager technology, enable simple interfacing to position sensors. This solution improves system performance by completing the decode tasks on-chip and reducing the communication latency, enabling faster control loop performance.

News ID 3702

Hall-Stand 1-340

HEITEC's Electronics Division inaugurates competence center in Eckental

On the occasion of the opening of the Electronics division's Competence Center, the first Technology Day takes place under the motto "HighTech by HEITEC". The site in Eckental near Nuremberg comprises 6,400 m². With this step, the bundled electronics expertise of the company - which means development, housing technology and production (in total about 120 employees) - is clustered under one roof. The establishment of this center creates new synergies in order to offer customers the best system solution from a single source in one place and thus an optimal basis to enhance their competitiveness.

News ID 3684

Hall-Stand 2-620

Coilcraft: compact current sense transformers sense current up to 20 Amps

Coilcraft announces its new CST7030 Series of surface mount current sense transformers which measure just 5.2 X 7.0 mm (with a max height of 3.0 mm) and sense up to 20 Amps of current at frequencies between 10 kHz and 1 MHz. Typical applications include load current measurement and control in switching power supplies and overload/short-circuit protection.

News ID 3810

Hall-Stand 1-205

Xilinx: Spartan-7 FPGA family delivers flexible, I/O-intensive devices

Xilinx announced the Spartan-7 FPGA family that will deliver I/O intensive devices for cost-sensitive applications. The new family will address connectivity requirements across a breadth of markets including automotive, consumer, industrial IoT, data center, wired and wireless communications, and portable medical solutions. All new Spartan-7 FPGAs will be supported on the no-cost Vivado Design Suite WebPACK Edition, as well as the Vivado Design and System Editions, to enable fastest time to integration and implementation.

News ID 3701

Hall-Stand 5-318

Conrad: motion detector for outdoor use

Conrad Business Supplies has introduced a new Passive Infrared motion sensor from European relay and timer specialist Finder. The Type 18.A1 provides the user with a wide, 110° horizontal angle of survey. The sensor orientation can be customised based on application requirements and parameters such as adjustable threshold and light on timer can be configured. Built to rugged and durable standards, this new detector joins over 850 Finder products already available from Conrad.

News ID 3853

Hall-Stand 1-510

Microchip: combined multi-touch and 3D-gesture modules for displays

Microchip announced its partnership with Silicon Integrated Systems (SIS) to provide customers with complete projected-capacitive touch (PCAP) and 3D-gesture interface modules, which will lead to faster development and lower costs. The modules will make it easier to design multi-touch and 3D gesture displays with Microchip's award-winning GestIC technology, which offers a hand tracking range of up to 20 cm from the display surface. Hand gestures are universal, hygienic and easy to learn.

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Tool environment opens door to integrated development

By Stefan Ingenhaag, Renesas

This article introduces the development environment for the Renesas Synergy Platform offering users a new opportunity to focus on the innovative aspects of their application. The tool support and development environment not only covers the entire development spectrum, but also adds specialized functionality.

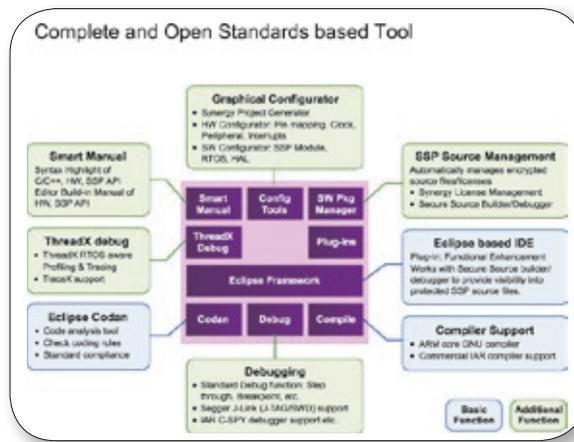


Figure 1. To support the rapid development of IoT solutions on the Renesas Synergy Platform, Renesas is offering a comprehensive, highly integrated, standards-based development environment, e2 studio.

■ The Renesas Synergy Platform was designed to simplify development for industrial and IoT applications by offering a comprehensive, integrated hardware/software solution. So it should not be surprising that the tool support and development environment for the platform not only covers the entire development spectrum from design and coding to evaluation and verification, but also adds specialized functionality to help developers more easily use the Synergy Platform and manage the commercially licensed Synergy Software Package (SSP).

Renesas Synergy MCUs will be supported by e2 studio, a new Eclipse-based Integrated Solution Development Environment (ISDE). Eclipse is the de-facto standard when it comes to embedded development environments and by adding new, solution-oriented components, Renesas engineers transformed the environment and e2 studio into a true ISDE, providing easy and innovative ways to develop applications on the Synergy platform. Developers who have worked with Eclipse-based development environments will find the e2 studio ISDE for the Synergy Platform very familiar. As a standard Eclipse-based platform, it can be extended by third-party tools that are available as an Eclipse plug-in. By building the ISDE on an industry standard, the product can closely follow the release schedule of the

Eclipse CDT (C/C++ Development Tooling) and users are ensured a future-proof development environment.

A new Renesas Synergy Project Generator and Project Editor make it easy to get started with Synergy platform by working with various graphical configurators on every aspect of a project. To simplify and automate configuration and code generation, the e2 studio ISDE offers five graphical configurators for different functions. A pin configurator allows the developer to configure the function of each MCU pin graphically, check consistency and generate code for configuration automatically. A clock-free configurator assigns clocks and performs dynamic validation. A third configurator manages the setup of RTOS threads, a fourth can be used to configure driver modules, and a fifth manages interrupts and prepares a total consistency check. C source code for initialization is automatically generated in the background for use in the Renesas Synergy project.

Generally developers use a debugger to step through their code from instruction to instruction and review the series of instructions that are executing to find and fix errors in the code. The debugger gives the user a historical view that can lend insight into how the software performed and what errors led

to a bug. While the instruction trail is stored in internal memory, it can be exported to an external tool like e2 studio which can illustrate how the software stepped through each instruction. All of the Synergy Platform development and starter kits feature on-board Segger J-Link debuggers for access to high reliability, low cost probes.

Trace buffering can be implemented in many different ways. On the low end of the Synergy Platforms MCU line, the S1 family featuring the ARM Cortex M0+ core, trace buffering is relatively limited in scope. The MCUs based on Cortex M4 cores, the S3, S5 and S7 families use a dedicated SRAM to store instruction history. The size of the SRAM is flexible. For the Synergy Platform, the Renesas design team selected two different buffer sizes. The team dedicated 1 KB of SRAM for the buffer on the mid-range Cortex M4 cores which, because of compression, traces about 64 branches. The high end S7 series MCUs feature an 8 KB trace buffer that not only offers significantly more storage, but also includes a feature called streaming trace. Using a few data pins, streaming trace brings out information in real-time while executing which allows the developer to follow program execution as it steps through thousands of instructions. The Renesas Synergy Platform is designed to save developers time by offering an inte-

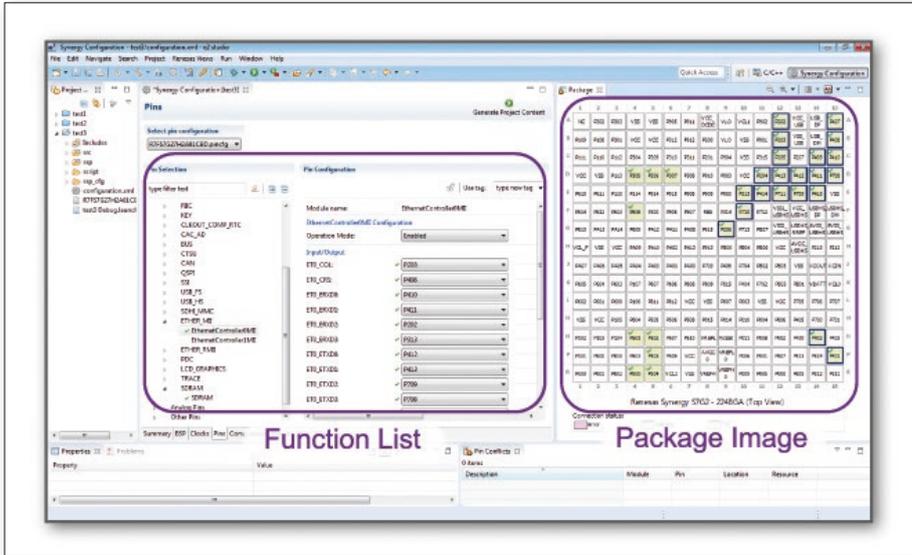


Figure 2. The Synergy Project Generator simplifies configuration and code generation by offering five graphic configurators for different functions.

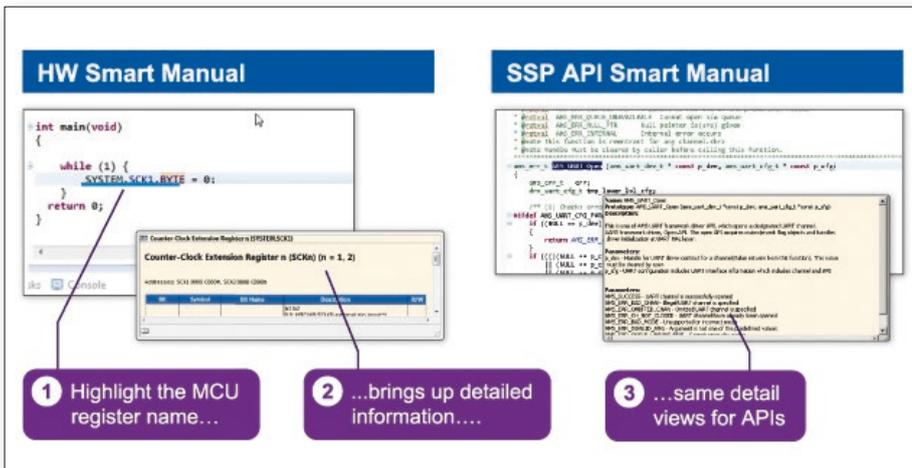


Figure 3. To accelerate development, Smart Manual features a context-aware link to additional data on both hardware registers and software components within the ISDE editor.

grated hardware/ software approach. A number of the new capabilities in the development tool ecosystem reflect that philosophy. Smart Manual is an excellent example. One of the more daunting problems developers face as embedded designs grow increasingly complex is how to efficiently manage and use the thousands of pages of documentation that accompany each design. Given that solutions based on the Synergy Platform can feature hundreds of hardware and software components, the user manual for a project can run into the thousands of pages. How do developers quickly and efficiently find the information they need?

Renesas engineers address this problem with a new tool called Smart Manual. The Synergy Tools have the ability to reuse design documentation in a context-aware manner while the tool is in use. For example, an engineer is configuring a device and activating named and known registers. As he or she moves the cursor over each register name, the tool will pop up information related to that register. When the engineer clicks on that information or accesses help, a context-aware link appears to additional data associated with that particular feature in an easily searchable format. It even pulls in relevant app notes and media-rich instructional material according to the topic at hand.

While this type of technology has been used with Renesas hardware before, the same capability is now available for the Synergy Software Platform (SSP). Hardware register definitions and associated data can lie hidden in many different documents. Similarly, information for software APIs is often hard to find. For the first time, the Synergy Platform Smart Manual provides this context-aware capability.



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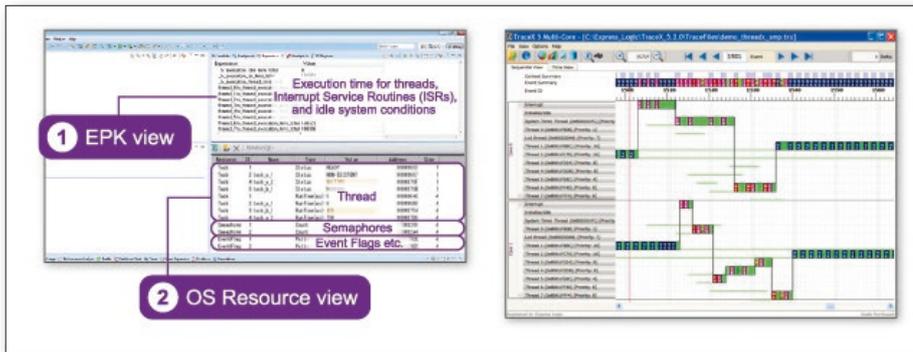


Figure 4. Extensive debug capabilities in both the system RTOS, Thread-X, and TraceX, a host-based analysis tool allow developers to quickly resolve programming issues.

ity for both hardware and software developers. In a similar manner, the development toolkit for the Synergy Platform integrates a high level of RTOS awareness to match traditional hardware tracing capabilities. The SSP is built around Thread-X, a widely used multitasking RTOS. To trace RTOS functionality over time, developers need to view correlation between different operations. To accomplish this task the Synergy design team implemented Express Logic TraceX, a host-

based analysis tool that gives developers a graphical view of real-time system events allowing them to better visualize how their system operates.

By tracking the occurrence of system events such as interrupts and context switches, developers using TraceX can identify the timing of events in the context of overall system operation and more easily resolve programming problems. TraceX works with ThreadX, which

constructs a database of system and application events on the target system during runtime. Events are logged with time-stamps and active threads are identified so they can be displayed later with a proper time sequence and associated with the appropriate thread. TraceX displays events graphically on a horizontal access representing time with the various application threads and system routines to which events are related listed along a vertical access. A summary display helps a developer analyze systems with many threads by showing all system events on a single horizontal line. Taken together with the traditional hardware debug capabilities of the environment, these capabilities give developers using the Synergy Platform tracing capability on both the hardware and the RTOS level.

Finally, the e2 studio ISDE works directly with the SSP via the secure source builder and debugger utilities to manage visibility into protected SSP source files, accounting for purchased source license files where appropriate and enabling users to always see the source C code but to modify/ save/print only the source files that are licensed. ■

Embedded World News

Hall-Stand 4-303

ANSYS: simulation solutions offer improvements in productivity, insight and performance

ANSYS 17.0, the next generation of ANSYS engineering simulation solutions delivers improvements to product development productivity, insight and performance. Simulation has been identified as one of the key pillars of the next industrial revolution, known as Industry 4.0. With the advent of the Internet of Things all products are getting smarter, new advanced materials are enabling lighter, stronger and more sustainable designs, and additive manufacturing enables users to 3-D print anything they can imagine. Unlocking the power of these trends is impossible without simulation tools' ability to virtually explore these vastly increased options to arrive at the winning designs of tomorrow.

[News ID 3868](#)

Hall-Stand 1-338

Wind River teams with IBM to accelerate edge-to-cloud IoT deployments

Wind River is collaborating with IBM to accelerate IoT deployments for industrial customers with new "edge-to-cloud" recipes designed to simplify and accelerate the development of smart connected devices. The new recipes guide customers on how to integrate services from IBM Watson IoT Cloud Platform with products from the Wind River Helix portfolio. Industrial customers using the recipes will

now be able to connect industrial devices running Wind River software to the IBM Watson IoT Cloud Platform and access to IBM Bluemix cloud services and analytics, allowing IoT developers to more quickly and easily develop smart connected devices.

[News ID 3867](#)

Hall-Stand 4-149

AdaCore: SPARK Pro 16 helps reduce certification effort for safety-critical systems

AdaCore announced the latest release of its SPARK Pro integrated development and verification environment, bringing a sound and mathematics-based static analysis technology to the challenges of software verification for high-assurance systems. SPARK Pro 16 provides enhanced coverage of SPARK 2014 language features and now supports the Ravenscar tasking profile, thus extending the benefits of formal verification methods to a safe subset of Ada 2012 concurrent programming features.

[News ID 3866](#)

Hall-Stand 1-211

Innodisk: new software monitors SSD more efficiently

Innodisk's latest SSD software iSMART 5.0 features new user interfaces, dashboard feature and iAnalyzer. Innodisk's iSMART 5.0 is designed to simplify information and provide an easy to read interface for all of our users. The iSMART tool monitors the health and

lifespan of Innodisk's SSD, provides details on usage patterns, and sets up alert settings before it reaches failure. With iSMART, our customers can properly integrate Innodisk's SSDs into their solutions by carefully monitoring behavior and health during development, integration, and mass production.

[News ID 3837](#)

Hall-Stand 4-218

R&S: oscilloscope highlights at embedded world 2016

At embedded world 2016, Rohde & Schwarz will again showcase its ever expanding oscilloscope portfolio. At the Rohde & Schwarz booth, visitors can get a first-hand look at the new R&S Scope Rider, the first handheld oscilloscope to offer the functionality and user experience of a state-of-the-art lab oscilloscope. One of the highlights will be the new R&S Scope Rider, the first portable oscilloscope for mobile use with the functionality of a lab instrument. The R&S Scope Rider packs five test instruments into a compact format: a lab oscilloscope, logic analyzer, protocol analyzer, data logger and digital multimeter. Its robust design makes it perfect for mobile installation and maintenance work. The fully insulated instrument meets measurement category CAT IV requirements and can be used to perform measurements at the source of low-voltage installations up to 600 V.

[News ID 3817](#)

Portable, mobile-use oscilloscope with lab instrument performance

By Wolfgang Patelay, Editor

This article presents the R&S Scope Rider handheld oscilloscope, which features the functionality and touch-and-feel of a state-of-the-art lab oscilloscope and combines five instruments in a compact format. It also includes an interview with Jörg Fries, Vice President Oscilloscopes, and Mathias Leutiger, Director of Product Management Oscilloscopes, on the launch of the R&S Scope Rider RTH.



■ The R&S Scope Rider is suited for use in the lab and in the field. With an acquisition rate of 50,000 waveforms per second, a 10-bit A/D converter developed by Rohde & Schwarz and a maximum bandwidth of 500 MHz for the analog input channels, this portable oscilloscope outperforms comparable instruments. It integrates five functions to offer a level of versatility not found in any other instrument. It is based on a high-performance oscilloscope featuring a precise digital trigger system, 33 automatic measurement functions, mask test and XY diagram mode. Plus, the scope can function as a logic analyzer with eight additional digital channels, as a protocol analyzer with trigger and decoding capability, as a data logger and a digital multimeter.

This wealth of functions makes it suited for a wide range of tasks. The handheld oscilloscope is the first to be equipped with a large-format capacitive touchscreen, allowing it to be operated as intuitively as a tablet PC. It also features large buttons for use with gloves and a practical multifunction wheel for convenient parameter adjustment. Users can confidently read their results at any time, as all measurement information is displayed in a clear, application-oriented manner on the brilliant screen. Well prepared for harsh environments, the Scope Rider IP51-certified

housing offers protection from environmental hazards such as dust and dripping water. The handheld oscilloscope has passed all mechanical load tests in line with military standards. The fully isolated instrument offers maximum safety and meets the measurement category requirements defined in IEC 61010-1 for CAT IV up to 600V and for CAT III up to 1000V. In addition to a microSD card, the instrument features USB and Ethernet ports for uncomplicated storage and transfer of measurement data. The scope also has an integrated WLAN interface. This can be configured as a hotspot to allow the instrument to be remotely controlled via a Smartphone, Tablet PC or laptop. A simple web browser on the mobile device is all that is required. There is no need for additional software or apps.

With more than four hours of battery runtime, the 2.4kg oscilloscope offers users a high degree of flexibility during installation, maintenance and in emergency situations. The new handheld oscilloscope goes beyond traditional electrical engineering to serve a broad range of industries. Technicians and specialists can also use it to gain a clear understanding of the condition of electrical installations, systems and components. For everything from measurement data acquisition in industrial and manufacturing settings to repairing ship-

board electrical drives and carrying out vehicle test drive analyses, the R&S Scope Rider is according to Rohde & Schwarz better suited to the needs of such tasks than any other oscilloscope in its class. The R&S Scope Rider is available as a four-channel or a two-channel instrument, the latter with a digital multimeter, with bandwidths of 60MHz, 100MHz, 200MHz, 350MHz and 500MHz. There will be trigger and decoding options available for I2C, SPI, UART, RS-232, RS-422 and RS-485 at the time of market introduction.



Figure 1. The R&S Scope Rider is suited for use in the lab and in the field and combines five instruments in a compact IP51-certified housing.



Figure 2. Jörg Fries, Vice President Oscilloscopes

We talked with Jörg Fries, Vice President Oscilloscopes, and Mathias Leutiger, Director of Product Management Oscilloscopes, on the launch of the new R&S Scope Rider RTH about the reasons for this new product placement.

B&S-ECE: With the R&S Scope Rider, Rohde & Schwarz is breaking new ground in the handheld oscilloscope market. How did you come to this decision?

Jörg Fries: Looking at the market, it quickly becomes clear that there has been no innovation in the area of handheld oscilloscopes for many years now. Of course, competitors offer diverse instruments. But none of them can compare with the functionality and versatility of our product. This is because with the R&S Scope Rider, we have developed an oscilloscope that can be used for mobile maintenance and service tasks as well as for lab applications. The time is ripe for a scope in this class.

Mathias Leutiger: Field applications are gaining in complexity. And even machinery on the production floor employs increasingly complex electronics. These environments call for a portable instrument capable of testing the relevant functionality. Competitors have not yet addressed this need at all. We put our expertise gained with the R&S RTO and R&S RTE lab oscilloscopes into the new development. The result is an instrument in the handheld class that sets entirely new performance standards. Rohde & Schwarz isn't exactly new to the handheld business, by the way. We've been delivering portable products for various applications since 2002.

B&S-ECE: Rohde & Schwarz has been in the scope business for only a few years and is now once again breaking new ground with its R&S Scope Rider. Why do you believe this is the right path to brand awareness?

Mathias Leutiger: With the R&S Scope Rider, we have an exceptional instrument that serves a broad range of industries and can be used by engineers, specialists, and technicians alike. This provides us with an enormous opportunity to promote recognition.

B&S-ECE: Why has Rohde & Schwarz decided to bring a handheld instrument to market in place of a high-end scope?

Jörg Fries: We want to offer a complete range of products in the oscilloscope market, and our portfolio is open to expansion in any direction. The launch of the R&S Scope Rider, in keeping with our claim of technology leadership in every product segment, represents a step that is consistent with our strategy. Given the good price/performance ratio of the product and based on our sales estimates, we expect that the Rohde & Schwarz name will gain in recognition, not only in labs, but also in segments where we are better known as a high-end provider. Another objective is to open up especially the large-volume markets with our portfolio expansions, and thanks to the R&S Scope Rider we now address over 60 percent of the global market. However, we haven't lost sight of the market for high-end oscilloscopes – we promise.

B&S-ECE: The R&S Scope Rider excels through its performance, versatility and usability. Why do you find these criteria so important?

Mathias Leutiger: In the market for electronic service and installation tasks, there is an increasing demand for instruments that offer a broad range of measurement options and can be operated independently from the mains supply - i.e. highly versatile, battery-powered instruments. However, versatility must be coupled with easy and intuitive



Figure 3. Mathias Leutiger, Director of Product Management Oscilloscopes

operation so as to minimize the obstacles associated with measurements and to permit efficient completion of tasks. High performance is an important factor in bridging the gap between what we know is needed and what is currently offered in this class of instruments. Performance features include protocol analysis capabilities, fast response times, a high acquisition rate of 50,000 waveforms per second, and a 10-bit A/D converter.

Jörg Fries: A fully isolated instrument is a definite plus in the field, especially when working with high voltages. The R&S Scope Rider satisfies measurement category CAT IV requirements and can perform measurements up to 600V at the sources of low voltage installations, offering users the utmost in safety. We also focused on a rugged design for harsh environments. The IP51-certified housing provides protection against environmental hazards such as dust and dripping water. The handheld oscilloscope has passed all mechanical load tests in line with military standards. Its usability is also exceptional.

B&S-ECE: What is so special about the instrument usability?

Mathias Leutiger: The R&S Scope Rider is equipped with a touch-screen, plus it features large buttons – an absolute must for use with gloves. Test reports are also easy to create. For example, immediately after obtaining a measurement result, the user simply presses a button to generate a report. The instrument additionally has an integrated WLAN interface that can be configured as a hotspot for remote control of the scope. This means that it can be located at the measurement site while the user operates it remotely via a tablet or smartphone from a safe distance, e.g. on the other side of a protective fence.

B&S-ECE: One distinctive feature of the Scope Rider is the long battery life. How is this ensured?

Mathias Leutiger: We have been active in the handheld market since 2002, and so we've got a few years of experience in this field. Our electronic design and power management are key. We know the power consumption of each and every component, and we know what components can be switched off for specific applications.

Jörg Fries: On average, we provide a runtime of over four hours. We know that other oscilloscopes can offer a longer runtime, but our instrument lets users complete their measurement tasks faster and more accurately. On top of this, the brilliant display screen provides excellent readability, so users can confidently read their results at any time.

Mathias Leutiger: A spare battery and a car adapter for charging the battery are also available.

B&S-ECE: What is the pricing like for the new handheld?

Mathias Leutiger: We are at a level similar to that of the competition in terms of pricing. With that being said, we are offering an instrument that is unrivalled when it comes to performance, versatility and usability. In other words, our customers get the high-quality T&M equipment that Rohde & Schwarz is known for at a price prevailing in this class of handhelds. We do not want to be the niche player whose instruments are considered affordable only for special applications.

B&S-ECE: You are entering the market with the claim “Two minutes to be sure.” What is the message behind that?

Mathias Leutiger: We need only two minutes to convince users that our

instrument meets all of their needs. Similar to someone getting a feel for their affinity with another person shortly after meeting for the first time.

B&S-ECE: What channels will be used for selling the instrument?

Mathias Leutiger: We will be building up a broad distribution network, ranging from catalog sales to online dealers.

Jörg Fries: The R&S Scope Rider represents a strong pillar in our Value Instruments offering. It features clear and intuitive functionality. Partners will therefore find it easy to sell the product. We want to establish a broad base and remain open for all partners. The Internet business will certainly play a greater role in the future, and new players will enter the market. The market is currently developing with high momentum, and all stakeholders involved can profit from that.

B&S-ECE: Thank you very much. ■

Embedded World News

Hall-Stand 4-432

LDRA chosen as Express Logic’s preferred partner for functional safety

LDRA announced that Express Logic selected LDRA as a preferred partner for automotive and rail certification. Express Logic chose LDRA because of LDRA’s extensive certification experience and the ability of its tools to achieve the additional verification requirements of ISO 26262 and EN 50128. The LDRA tool suite, known for its comprehensive software test and verification capabilities, reaches above and beyond competitive products to offer customers the most complete compliance capabilities on the market.

[News ID 3670](#)

Hall-Stand 1-620

PEAK-System: pass-thru support for PEAK CAN interfaces

The international standard SAE J2534 (Pass-Thru) defines the communication interface between electronic control units and computer software being used for programming and diagnostics. With the programming interface PCAN-PassThru API, PEAK-System publishes an implementation of this standard for Windows.

[News ID 3626](#)

Hall-Stand 4-609

EUROS: security solution for OPC UA

EUROS Embedded Systems announces its innovative, combined hardware and software cryptographic solution, especially developed to be used in industrial environments, where the need for a secure data encryption is mandatory. In particular, EUROS Security was designed to be used as data encryption platform in an OPC UA environment in order to replace the normally used OpenSSL encryption mechanism, which usually relies on software encryption solutions based on pseudo-random number generators.

[News ID 3703](#)

Hall-Stand 4-259

IS2T now operates under the brand MicroEJ

In order to clarify and strengthen its identity and present a unique face to the world, Industrial Smart Software Technology (IS2T) is now operating under the brand name MicroEJ. Although the company legal name remains IS2T and will be used in formal documents (contracts, agreements, quotations, etc.), the company will present itself as MicroEJ.

[News ID 3694](#)

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When the debugger becomes the basic tool for integration and testing

By Heiko Riessland, PLS

To ensure even better control of the very large volumes of data with embedded software nowadays, a new generation of debuggers is needed, which will provide users with extensive testing capabilities at the system level through to automated report generation, in addition to classic basic functions.



■ Complex embedded software programs, with several hundreds of megabytes of source code and constantly growing quality demands, increasingly require highly automated test programs. Such innovative testing methods are even essential for reliably bringing together individual software parts when the development is carried out by large teams that are based at different locations. In certain cases, they are in the meantime even mandatory through relevant standards, such as the automotive standard ISO 26262.

However, the desired effectiveness can only be achieved if the debugger used also actually fully provides its functionality and its graphical user interface in an appropriate form for automated testing. A tool is needed for this that besides the classic debugger features, for example, control and monitoring of the target with a wide range of possibilities for viewing and analyzing, and also provides new capabilities via a graphical user interface. The complete functionality must also be usable in semi- or fully-automated operation.

Regression testing is a typical example of such processes that can run fully autonomously with suitably equipped tools. For this purpose tests for certain software functions are developed beforehand, for example, described by inputs and outputs for functions or modules.

Such, ideally automated, test runs serve as a reliable proof of a specific functionality even after several changes to the software. A third program frequently takes over management and control of the test cases with this type of application. The actual user interface of the debugger is therefore not used at all, only its functionality.

In turn, semi-automated use of the debugger is particularly interesting for the integration of various software parts into a complete application. The application is manually tested under various operating conditions by operation via the graphical user interface. Besides the debugger, the control unit is still connected to a complex hardware-in-the-loop (HIL) system, which simulates the intended control unit environment. One aspect is particularly important in this context: scripts that use the debugger functionality can immediately provide a detailed report about the state of the target and the application software whenever anomalies or errors occur. At the same time, for example, at the location of a breakpoint in an error or trap function, all relevant variables, registers, memory contents, etc. are stored for analysis or subsequent reverification of the software. Furthermore, with software that is running correctly, a script for automated code coverage analysis can, in the ideal situation, be started by means of predetermined functions.

Code coverage is a method for measuring the test coverage and thus an indirect determination of the software quality and is stipulated in relevant standards, such as ISO 26262. At the same time, it is determined whether during testing all instructions (statement coverage) and branches (branch coverage) or different logical connections (modified condition/decision coverage, MC/DC) will run within software. A complete MC/DC analysis is mostly only possible with code instrumentation and thus accompanying change of the runtime and size of the application. Applications, for which this variant are out of the question for technical reasons, instead usually use trace data-based branch coverage obtained in real-time. Provided compilers with enhanced debug information are available, a complete branch coverage analysis is possible, even on highly optimized code.

In this case, the debugger not only takes over control of the target and capture/analysis of trace data, it also generates an automated report, which in turn ensures reliable documentation and repeatability of the measurements. Display of the code coverage is possible for the level function, line number in the source code and also machine instruction. In the extract shown, the source text is displayed. It is possible to navigate to the machine code level via generated links on the line numbers.

Coverage Overview about Source Line Ranges:

Line number	Start address	Range length	Unreached instructions	Partly covered instructions	Statement coverage in %	Branch coverage in %	Source Line(s)
107	0x8002FDE2	0x8			100	0	EE_S0_LANX_RA(0x10) - EE_S0_PAT_RA(1); /* Restless previously send control information of a thread */ _INLINE__ void __ADDRESS_INLINE__ EE_S0_LANX_RA(void) EE_S0_PAT_RA(1);
114	0x8002FE6C	0x8			100	0	EE_S0_PAT_RA(1) - EE_S0_LANX_RA(0x10); _INLINE__ void __ADDRESS_INLINE__ EE_S0_PAT_RA(1) EE_S0_LANX_RA(0x10);
120	0x8002FDA0	0x4	1		66	0	street EE_S0_PAT * const p_soa = &EE_S0_SYSTEM_SOCKET;

Figure 1. Extract from an HTML-based code coverage report

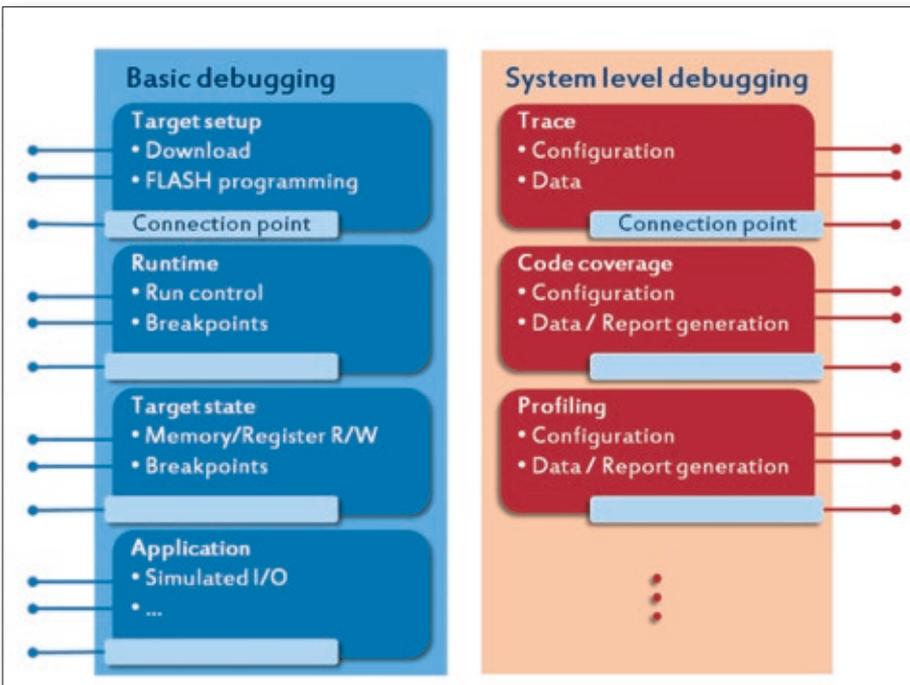


Figure 2. The object model of the UDE includes nearly all functions of the debugger.

Language	Method
IDL	HRESULT ReadVariable ([in] BSTR Expression, [out, retval] VARIANT* Variable);
C++	Debugger->ReadVariable (Expression, &Variable);
C#	Variable=Debugger.ReadVariable(Expression);
JScript	Variable=Debugger.ReadVariable(Expression);
Perl	\$Variable=\$Debugger->ReadVariable(\$Expression);
PowerShell	\$Variable=\$Debugger.ReadVariable(\$Expression)
Python	Variable=Debugger.ReadVariable(Expression)
VBScript	Variable=Debugger.ReadVariable(Expression)

Table 1. Use of a method of the UDE object model in various languages

HyperText Markup Language (HTML) is used as the standard output format. The formatting can easily, and without too much effort, be adapted to customer-specific requirements via a style sheet.

Availability of the debugger functionality via a general-purpose software interface is a precondition for the automated method already

described. With PLS Universal Debug Engine (UDE), Microsoft Component Object Model (COM) is used here as the basic technology. COM has established itself over a long period of time as the de facto standard in the Windows world. Even Windows itself provides a large share of its newly added functions via COM interfaces. The object model of the UDE includes nearly all functions of the debug-

ger such as flash programming, run-control, reading and writing of target memory in symbolic form, trace data capture and analysis, and much more. One great advantage of a COM-based application programming interface (API) is that it can be used by a very large number of various languages. This includes C, C++, C# and other .NET languages together with scripting languages such as JavaScript, Python, Perl and VB Script or Windows own PowerShell, because they can all handle COM components. Table 1 shows a general description of the UDE API on the basis of interface description language (IDL) and their use with various languages.

The functionality of the debugger can be used in three different ways. Firstly, scripts can be executed within the graphical user interface. At the same time, a link with menu points or toolbar buttons is possible for quick access. In addition, the built-in script debugger supports testing with line-by-line processing, variable display and the possibility to set breakpoints. The second possibility of using the debugger functionality is user-specific windows that can be added to the user interface. At the same time, the appearance is defined with the description language HTML; the complete COM-based API can be accessed for the display logic. Finally, the debugger can also be started, configured and controlled completely externally. Thus, access for third-party provider tools is ensured. A good example of this is the availability of an application written in PERL, which provides almost all functionality of the Universal Debug Engine (UDE) in a command shell and can be a very useful template for own test scripts. ■

Embedded World News

Hall-Stand 4-432

LDRA extends TÜV certification of compliance tools

LDRA has been awarded TÜV certification for all major safety-critical standards, further securing LDRA's leadership in the software compliance and certification space. The TÜV certificate assures LDRA customers and partners that the LDRA tools fulfil the requirements for support tools and are qualified to be used in safety-related software development. This TÜV certification confirms LDRA's compliance to industrial safety (IEC 61508), automotive (ISO 26262), and rail transportation (EN 50128) for LDRAunit, LDRAcover, and LDRArules and adds compliance for medical devices (IEC 62304) and nuclear (IEC 60880) for these LDRA products as well as the LDRA tool suite.

News ID 3667

Hybrid verification for high-integrity software

By Benjamin M. Brosgol, AdaCore

Testing has traditionally been the principal way to verify that software in a high-integrity system meets requirements. Thanks to recent advances in programming language technology it is now practical to use formal methods in conjunction with testing, both lowering the cost of verification and increasing the confidence in the resulting product.

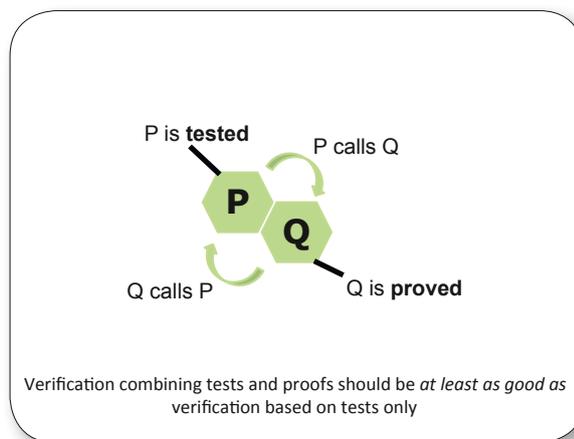


Figure 1. Combining tests and proofs

■ Suppose that a defect in your software can lead to a catastrophic system failure, with a resulting loss of life or other unacceptable consequences. How do you achieve confidence that the risk of such defects is eliminated, or at least reduced to a tolerably low level? That question has been on the minds of software developers, regulatory agencies, and other stake-holders since the earliest deployment of computer-based systems in high-integrity (e.g. safety-critical and/or high-security) systems. Software defects (often euphemistically referred to as glitches) can arise in various ways, for example by installing the wrong version of some component during an update. This article focuses on the correctness of the code itself: how to verify that the software meets its requirements and has no unintended behaviour.

Testing has traditionally been the main technique for software verification. However, the observation of the late computer scientist Edsger Dijkstra in 1969 still holds today: “Program testing can be used to show the presence of bugs, but never to show their absence.” Ideally, we would like to be able to demonstrate, with mathematical rigor, that our program is correct. This is hardly a new idea; formal methods (proofs of program properties such as correctness) have been a subject of active research since the 1960s. But for various rea-

sons this approach has been slow to make it into the mainstream. Among the problems is the need to restrict the programming language to a subset that is formally analyzable, and such subsets have typically been too constrained to be useful in practice. As another issue, proof technology requires considerable computing power and has not scaled up well for realistic programs. There is also a perception that applying formal methods requires a background in mathematical logic that is outside the expertise of the domain specialists who develop the software. Finally and significantly, there is a perceived methodological issue; formal methods have a reputation for requiring a particular development approach that could not be easily introduced into a project in an incremental fashion or combined with traditional verification activities (in particular, testing).

These issues, though challenging, are solvable; this article will use the SPARK 2014 language/verification technology as an illustration, with a focus on how to combine formal methods with testing. The goal of such hybrid verification is to achieve a level of confidence at least as high as would be obtained through testing alone (figure 1). See the sidebar for a summary of SPARK 2014 (simply referred to as SPARK below), which is a subset of the most recent Ada language standard, Ada 2012.

Formal analysis is based on the concept of a contract; an example of a subprogram with precondition and postcondition contracts is shown in figure 2 and is legal in both SPARK and Ada. The precondition is a requirement on the caller of the function, and it can be assumed to be true in the body of the function. The postcondition is an obligation on the implementation of the function, and it can be assumed to be true by the caller after the function returns.

The Vector type is an array of integer values, with different array objects possibly having different lengths. The Min function requires a non-empty Vector as its parameter, hence its precondition states that the length must be greater than zero. The postcondition expresses the function guarantee: the result value is less than or equal to each item in the Vector, and it is one of the elements of the Vector.

The notion of a contract is not new; for example it has been fundamental to the Eiffel language since the early 1980s. The innovation of the SPARK/Ada approach is the flexibility that it offers, since a contract can be treated in any of three ways based on the policy selected by the program: evaluated at runtime according to standard Ada semantics, raising an exception if false, proved statically by the SPARK tools, or else reported as not provable,

```

package Vector_Pkg is
type Vector is array(Positive range<>) of Integer;

function Min(V : Vector) return Integer
with Pre =>V'Length> 0,
     Post => (for all Item of V =>Min'Result<= Item) and
             (for some Item of V =>Min'Result = Item);
end Vector_Pkg;

package body Vector_Pkg is
function Min(V : Vector) return Integer is
M : Integer := Integer'Last; -- Largest Integer value
begin
for I in V'Range loop -- I ranges over the index values
if V(I) < M then
M := V(I);
end if;
end loop;
return M;
end Min;
end Vector_Pkg;
    
```

Figure 2. Code example of a subprogram with precondition and postcondition contracts

and ignored and regarded as a comment to the human reader. And unlike the approach found in other proof technologies, where the contract notation is itself a separate specification language, SPARK contracts use standard Ada syntax and semantics. Proved statically involves proving, at each point of call, that the

precondition is satisfied by the actual parameter(s). It also means analyzing the subprogram body and proving that, if the precondition is satisfied and the subprogram terminates, then the postcondition will be met on return to the caller. If a contract cannot be proved, this could mean either that the code is inconsistent

with the contract (so that one of them needs to be corrected) or that there is not enough information to prove that the contract will be met. In the latter case the developer may be able to supply additional information to assist the proof engine.

Thanks to advances in proof technology and the increased speed and capacity of modern computers, formal methods are a practical static analysis technique, and they do not require expertise in mathematical logic. As illustration, undergraduate students at Vermont Technical College in the US, with no previous experience with Ada or formal methods, learned and used SPARK to develop the software for a CubeSat satellite that recently completed a successful two-year orbital mission.

How might formal methods be applied in practice, and in particular how can they be combined with testing? Several scenarios are possible; mixing and matching tested and proved code is performed at subprogram call boundaries.

In the case of testing only the contracts are enabled for runtime checking during the tests (Ada semantics); robustness tests can exer-

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cise the code with calls that violate preconditions. After sufficient confidence is gained, the contract checks can be disabled for efficiency, but the contracts remain in the source code as useful and unambiguous documentation for whoever is reviewing or maintaining the program. This approach can be used with full Ada; there is no need to comply with the SPARK subset.

Many constructs in Ada (and thus also in SPARK) have implicit preconditions associated with them. For example an array index has to be within the bounds of the array (thus preventing buffer overrun), and the values of the operands of an integer expression have to be such that the operation will not overflow. If these preconditions are violated then an exception will be raised. The SPARK proof tool will attempt to prove the implicit contracts. If it succeeds then that guarantees that runtime exceptions will not be raised. If any cannot be proved then the programmer will be alerted to the potential problem and can investigate further; in some cases the proof tool may be able to construct a counterexample showing how the precondition will be violated.

Thus in an example such as the Min function, although there is not enough information in the function body to allow the postcondition to be proved (a loop invariant needs to be specified), the SPARK proof tool can still verify that the code cannot raise an exception. This is an important benefit. The functional correctness of the program can then be established with traditional testing methods as described.

In a large application it may be appropriate to apply formal methods to critical kernel code, but unrealistic (perhaps because of the use of full Ada or other languages) to use proof technology on modules that invoke the proved code. In order to rely on the proof of the kernel code, the developer of the unproved code needs to ensure (by analysis, inspection, or testing) that all variables that are used as input by the proved code are initialized, and also that the precondition of the proved code is satisfied at each call. The postcondition of the proved code can be assumed by the caller, which may simplify the testing.

The need to call unproved code from proved code can arise, for example, if a low-level routine in assembler or in a language not amenable to proof technology is to be invoked from a subprogram that will be formally analyzed. An interface to the unproved code can be specified in SPARK with the relevant contracts. The developer of the unproved code needs to ensure, through testing, that all data flow dependency contracts are satisfied and also that the postcondition for the unproved

code is met. The calling code will be analyzed to make sure that the precondition for the unproved code is satisfied at each call. The techniques just described can be used when an existing project is to be extended with modules that will be subject to formal analysis. Furthermore, if the project is in Ada the SPARK proof tool can automatically synthesize flow analysis contracts from the bodies of the subprograms, thus providing a starting point for formal verification (if the subprogram is in the SPARK subset).

In a language with compile-time type checking (such as Ada, C, and C++) detecting an error such as an assignment of an integer to a record (struct) does not require runtime testing; defects of this kind are caught early and inexpensively because the program will not compile. Analogously, formal methods can move runtime check failures and even logic errors into the same detected before testing starts category. Formal methods can thus bring tangible benefits to the software verification process, providing mathematics-based

assurance concerning program properties that otherwise might only be demonstrated with significant testing resources. Software certification authorities have taken notice. For example the DO-178C [7] standard for airborne software has an associated supplement DO-333 [8] that shows how formal methods may be used to automate some of the verification activities and thereby reduce the certification effort and cost.

A major impediment to the adoption of formal methods in the past has been the apparent need to commit to new development and verification processes. That is no longer the case. As illustrated by the SPARK 2014 language and proof technology, formal verification and traditional testing methods are highly compatible and complement each other in a well-defined fashion. Contract-based programming is in effect making the low-level requirements part of the source program, and with the Ada/SPARK approach the developer can choose to verify them either statically or dynamically based on project goals. ■

SPARK 2014

SPARK 2014 is an Ada 2012 subset that is amenable to proofs of program properties ranging from absence of runtime errors to compliance with formally specified requirements. It includes most of Ada data type facilities (numeric types, array types, record types, enumeration types), code modularization (subprograms), generic templates, modules (packages), encapsulation (private types), object-oriented programming, and a subset of Ada concurrency features (the Ravenscar profile).

SPARK excludes access types (pointers) and the goto statement, prohibits aliasing of assignable objects (where the same object is designated by different names), and ensures that all expressions, including function calls, are free of side effects. These restrictions guarantee deterministic behaviour (thus no implementation-dependent or implementation-defined effects) and facilitate formal analysis. For example, an attempt to read the value of an uninitialized variable is not permitted in SPARK.

The SPARK subset is sufficiently expressive to implement critical applications, and earlier versions of the language have been used in Air Traffic Management, aircraft avionics, smart cards, and many other safety-critical and high-security systems. Further, ultra-high reliability was achieved via a level of effort no greater than with traditional (testing-based) methods, in part because errors were detected very early.

Formal analysis of SPARK programs is based on the inclusion of contracts in the source code. SPARK uses the Ada 2012 syntax for contract-based programming, so any SPARK program can be compiled by a standard Ada compiler.

SPARK contracts are used for two main purposes: flow analysis, and requirements on functional behavior. Flow analysis contracts relate to data initialization and a subprogram dependencies on global data, and also to the relationship between a subprogram inputs and its outputs. A functional behavior contract is an assertion about the program state at a particular point in execution. It is specified as a Boolean expression that can reference subprogram parameters (both on entry and return), the subprogram result value (for a function), and local and global data.

The SPARK proof tool will analyze a program, check that it complies with the SPARK language restrictions, and attempt to prove the contracts that are explicitly supplied. It can also synthesize flow analysis contracts (if not present) from subprogram bodies. ■

Hall-Stand 5-318

Conrad stocks two-channel digital storage oscilloscope from Tektronix

Conrad Business Supplies has started stocking a new 30 MHz two-channel digital storage oscilloscope from leading manufacturer of test and measurement equipment, Tektronix. The TBS1032B - exclusively available at Conrad - is well-suited to customers in the educational, automotive and industrial sectors who are looking for a low bandwidth solution which delivers excellent value, without compromising on features. This new device will join Conrad's selection of over 350 digital oscilloscopes from Tektronix and many other leading brands.

[News ID 3731](#)

Hall-Stand 4-310

PLS simplifies development with complex heterogeneous high-end SoCs

PLS Programmierbare Logik & Systeme has not only expanded the latest version of its Universal Debug Engine with a number of additional trace and debugging functions, but has also added completely new features for test automation. This now enables users to utilize the enormous performance of the newest multicore System-on-Chip families, with as few restrictions as possible. The UDE 4.6, which PLS is presenting for the first time at embedded world 2016 supports a wide range of different architectures and new device families such as: the Power Architecture-based SPC58 E series and the ARM Cortex-M7 core-based STM32F7 series from STMicroelectronics, the XMC4800 devices from Infineon, which are the first-ever ARM Cortex-M4-based microcontrollers with EtherCAT integrated, and the Zynq-7000 family from Xilinx, which is equipped with a dual-core ARM Cortex-A9 and additional FPGA. The Universal Emulation Configurator of the UDE for definition of trace-based measurement tasks has been expanded with a library for the Mini-MCDS (Multi-Core Debug Solution) of the current AURIX devices from Infineon. This means that some of the diagnostic possibilities, which until now were only offered by special Emulation Devices, are now available for the first time in production chips. A JTAG standard debug interface or Debug Access Port on the target is the only requirement for the use of this feature.

[News ID 3787](#)

Hall-Stand 4-250

Vector Software releases VectorCAST 6.4

Vector Software announced the release of VectorCAST version 6.4, the most advanced test automation platform for C/C++ and Ada development. VectorCAST 6.4 includes a host of new features and enhancements in data aggregation, reporting, usability, and tool integration.

[News ID 3726](#)

Hall-Stand 4-658

GrammaTech and the Navy take a SMAC at cyber-security

GrammaTech has been funded by the Navy to continue its research on Scenario-Based Modeling and Checking (SMAC), an approach to defending software applications against cyber-security attack - benefiting the communications, finance, logistics, and other commercial industries under attack today from cyber criminals. Today's software applications, expected to operate with minimal human oversight, have the potential to act erratically after being hacked, exposing critical data or harming physical equipment and humans.

[News ID 3662](#)

Hall-Stand 4A-338

Lynx brings military grade security to the IoT

Lynx Software Technologies is delivering demonstrations and a presentation at the 10th Embedded Conference, Stockholm, showing how its Lynx RTOS and LynxSecure virtualization solutions offer unique safety and security functionality while embracing open standards. This is the third year in succession that Lynx is participating in the event, which is celebrating its tenth anniversary in 2015.

[News ID 3609](#)

Hall-Stand 4-270

Express Logic and EnSilica to bring ThreadX RTOS to eSi-RISC processor cores

EnSilica and Express Logic have collaborated to port Express Logic's ThreadX real-time operating system to EnSilica's eSi-RISC family of silicon-proven, highly configurable embedded processor cores. ThreadX ease-of-use is facilitated by its intuitive, highly functional API and advanced, instant-on RTOS features. ThreadX features efficient real-time responsiveness and code compactness that appeal to developers of the most demanding, deeply embedded consumer and industrial electronics.

[News ID 3728](#)

Hall-Stand 4-238

SEGGER: maximum insight with free real-time analysis tool

SEGGER announce the release of SystemView, a free tool enabling the visual analysis of any embedded system. SystemView gives complete insight into the behavior of a program, with minimal side effects on the observed embedded system. SystemView offers cycle accurate tracing of interrupts and task start stop as well as task activation and API calls when an RTOS is used. It visualizes and analyzes CPU load by task and interrupts and scheduler. Test setups with LED and oscilloscope are a thing of the past.

[News ID 3642](#)

Hall-Stand 4-260

Altium: new release of TASKING compiler suite for ARM

Altium has announced a new release of its TASKING compiler suite for ARM, extending its support for many new ARM Cortex-M based microcontrollers, including Cortex-M7 variants. This new compiler suite is available now and all existing customers with a maintenance contract can upgrade to the new release for free on the TASKING website.

[News ID 3660](#)

Hall-Stand 4-541

LieberLieber Embedded Engineer 2.0 offers generation of C++ source code

LieberLieber Embedded Engineer for Enterprise Architect has been developed as part of the tool chain for the development of Embedded Systems, since only with an integrated solution can model-driven approaches in embedded software development be efficiently applied. Embedded Engineer Version 2.0 offers improved code generation from ANSI-C code from UML structures, state machines and activity models, as well as - brand new - the generation of C++ source code.

[News ID 3639](#)

Hall-Stand 1-620

PEAK-System: optical LIN bus connection for explosion-risk areas and for EMC tests

In order to use the LIN field bus also in areas subject to explosion hazards or to electromagnetic susceptibility (e.g. during EMC measurements), PEAK-System has developed the PLIN-LWL. This can be used to substitute a segment of the electrical LIN bus by fiber optic cable. A PLIN-LWL set contains two converter modules and a duplex FO cable with standard ST connectors.

[News ID 3769](#)

Hall-Stand 4-170

SYSGO: Siemens chooses PikeOS Hypervisor for electric cars

Siemens has chosen the PikeOS Hypervisor for its new electronics and software platform for electric cars. As seen in aviation technology, standardized hardware and software modules provide the basis for a unified computing architecture that can replace function-specific controller modules (ECUs). The PikeOS Hypervisor serves as the backbone of the software architecture. As a virtualization platform with hard real-time characteristics, PikeOS enables a predefined set of functions according to the plug-and-play principle. The new platform provides plenty of scope for individual product bundling. The first customer to make use of these advantages is Deutsche Post subsidiary StreetScooter from Aachen.

[News ID 3832](#)

Hall-Stand 4A-101

Mouser: Intel NUC kits available in nine models

Mouser Electronics is now shipping the newest Intel Next Unit of Computing (NUC) kits, powered by 5th generation Intel Core 14nm processors and new Intel Pentium and Intel Celeron 14nm processors. At a small 4.5 × 4.3-inch footprint, these new mini-PCs target compact intelligent systems that require high-performance data, graphics, and media capabilities to fit a variety of needs.

[News ID 3657](#)

Hall-Stand 4-541

LieberLieber one of top 20 Enterprise Architecture solutions providers

Although no uniform definition of Enterprise Architecture exists, the umbrella term is used to describe how IT supports business capabilities in today's organizations. The Enterprise Architecture is then shown in models using one of several Enterprise Architecture frameworks, the principles of which are implemented by Enterprise Architecture tools for which only basic features and a unified vocabulary are defined. LieberLieber focuses on modelbased development using the Enterprise Architect modeling platform from Sparx Systems.

[News ID 3633](#)

Hall-Stand 4-238

SEGGER unveils Embedded Studio PRO Development Platform

SEGGER released its Embedded Studio PRO offering, combining the company's user friendly Embedded Studio development environment, along with a selection of its key embedded software components, an industry-leading J-Link PLUS debug probe, plus an emPower evaluation board. This means that whatever the nature of the project, the development process can begin immediately.

[News ID 3811](#)

Hall-Stand 1-519

LPKF: circuit board plotters and through-hole plating solutions at embedded world

LPKF Laser & Electronics will present two new circuit board plotters and an optimized laboratory system for reliable galvanic through-hole plating at the embedded world trade fair. Getting you from idea to printed circuit board in just one day – LPKF provides laboratory solutions for everything from board structuring to assembled single-sided, double-sided, and multilayer PCBs. The application specialists will present these processes as well as the latest developments in the field at Booth 519 in Hall 1.

[News ID 3871](#)

Hall-Stand 4-325

Green Hills: INTEGRITY RTOS solutions for Intel Broxton family

Green Hills Software has announced the availability of Green Hills Software's safe and secure 64-bit multicore software solutions for the Intel Atom Broxton/Apollo Lake family of automotive processors. Now automotive Tier 1s and OEMs can realise their long-term vision for high performance, safe and secure software-defined cockpit electronics targeting but not limited to digital clusters, in-vehicle infotainment (IVI) and ECU consolidation.

[News ID 3644](#)

Hall-Stand 4-173

Renesas expands IoT platform with SSP, S7G2 MCUs and first Verified Software Add-on

Renesas Electronics announced new developments for the Renesas Synergy Platform, including the commercial release of the Renesas Synergy Software Package (SSP) version 1.0.0, mass production availability of the S7G2 Renesas Synergy Microcontrollers, and availability of the first Verified Software Add-on (VSA) software from VSA Program partners.

[News ID 3814](#)

Advertorial



CodeMeter µEmbedded
High Performance Security Embedded in Infineon XMC4000 Industrial Microcontroller based on ARM® Cortex®-M4

With CodeMeter µEmbedded, software developers can protect application code and intellectual property against reverse engineering also on microcontrollers, as well as implement a license control system.

The license is bound to a unique ID of the microcontroller. Licenses can be activated directly in a production environment during manufacturing time. In addition, features on demand can be enabled later via remote file update.

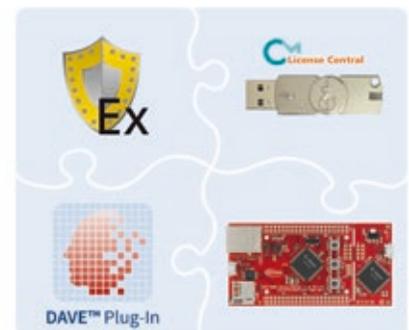
Furthermore, CodeMeter µEmbedded can be used to securely store symmetric and asymmetric keys. The keys themselves are located in a protected memory area, and can only be used on the device with a matching ID.

Typical applications

- License control of microcontrollers
- Monitoring of production volumes through licensing of individual devices
- Secure encrypted transfer of the application code and updates into the device

Features

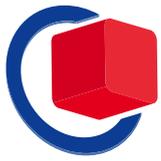
- Firmware integrity protection at runtime, update, upgrade and maintenance
- IP protection against reverse engineering and piracy
- License lifecycle management
- Small memory footprint for the loader code (<60 kBytes)
- GUI plug-in for DAVE™



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embeddedworld **Preview** **Boards & Modules**

Lead Story

Computer-on-Modules:
lifting Skylake into the cloud



ADLINK
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COM 
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Computer-on-Modules: lifting Skylake into the cloud

By Daniel Piper, ADLINK Technology

Omnipresent Internet of Things (IoT) and Industry 4.0 trends are creating increasing demand among engineers for cloud-based services. New sixth-generation Intel Core COM Express Computer-on-Modules by ADLINK come with exactly the right features to fulfill these demands.



Figure 1. Sixth-generation Intel Core processor-based ADLINK COM Express modules come along with SEMA Cloud services.

■ The launch of the new sixth-generation Intel Core processors (formerly Skylake) comes at a time when the IoT and Industry 4.0 trends are dramatically changing the way we design embedded and industrial-grade devices. No longer just the device itself is in the user focus but also – and sometimes even more importantly – the services that are provided along with the devices. Consequently, the race is on for engineers to implement services into their offerings. Intelligent services often require connection to a back end server or a cloud environment. And a back end server or a cloud for distributed devices need local gateway technologies to connect the devices. In turn these gateway technologies call for local connectivity, communication and security features that have to be handled by the gateway and/or the device processor. Thus, more local intelligence and bandwidth is required. How do the new sixth-generation Intel Core processors cater for this new era of connected applications?

It is not only the increased CPU speed and up to triple the video performance for up to three Ultra-HD or 4k displays that set this new technology apart. Major improvements are also secured by the new DDR4 support - compared to DDR3 memory DDR4 reduces overall power consumption and enhances the overall performance with two

major improvements. Firstly, it offers higher memory frequencies for faster data transfers and, secondly, the memory capacity has been doubled. Using new DDR4 modules the COM-Express modules can now support 32 gigabytes of memory - an important feature for both virtualized operating systems with need for more memory, and for space-restricted systems with increased density as well as limited power consumption. DDR4 support eliminates the bottleneck of designs with two memory sockets which is standard on COM Express-based Computer-on-Modules. Furthermore, the new processors feature more high-speed I/Os to cater for the heavy big data demands common to complex IoT and Industry 4.0 applications.

Additionally, hardware-accelerated, CPU off-loading AES encryption technologies and other security features, which are crucial to IoT-connected devices, have been enhanced. Processor-integrated technologies such as Intel Boot Guard, Intel Secure Guard Extensions and Intel Memory Protection Extensions, for example, help prevent system threats from malware, protect sensitive data from rogue software and prevent malicious attacks using buffer overflows. The configurable Thermal Design Power (cTDP) is also new. This enables enhanced control of embedded devices thermal behavior. Normally designers

had to adjust the physical design and/or application to the thermal design characteristics of the chosen CPU, with cTDP they now have a method to reduce the TDP of the processor to better fit with the design constraints. This is a key element especially for passively cooled – also named fanless – designs. Depending on the CPU it is now possible to leverage processors of the Intel Core-i7/5/3 family with 10W or 7.5W cTDP. At the same time, designers can now access the maximum processor performance by carefully configuring the processor heat dissipation to the capabilities of the system design.

Embedded designers will also appreciate the JTAG over USB 3.0 support, which allows chip-level debugging without the need for direct access to the processor. All these features make the sixth-generation Intel Core processors the right choice for a whole range of new embedded and IoT-connected devices in vertical markets such as medical, industrial, transportation, digital signage and professional gaming machines.

For designing space- and TDP-restricted, fanless small form factor systems requiring high performance Intel Core i3/5/7 processors with dedicated interfaces, COM Express Computer-on-Modules offer the right technology platform. They are standardized, small

and scalable and are offered in various versions from a wide range of embedded computing vendors. ADLINK, for example, offers two form-fit-function compatible designs for increased scalability and flexibility: the COM Express Type 6-based COM Express Basic (125 x 95mm) and COM Express Compact (95 x 95mm) modules. Both are compatible with all current carrier boards as well as backwards-compatible with earlier designs. This helps OEMs secure their investments in existing designs requiring a performance and/or connectivity upgrade. With its board-integrated SEMA (Smart Embedded Management Agent) board functionality and the SEMA Cloud connectivity for IoT-based monitoring, managing and maintenance services, ADLINK also helps engineers lift their new Intel Core processor-based designs easily into the cloud to create a better end-user experience, reduce costs, build revenue, enable new applications in various industries such as medical, gaming or industrial automation.

Take the medical arena. Here, embedded designs are important elements of medical devices and instruments and in all circumstances, reliable operation has to be guaranteed. With SEMA Cloud, space-restricted fanless medical designs with a tight thermal envelope benefit, for example, from alerts about inappropriate power consumption and corresponding heat dissipation before a system fails. This enables countermeasures – like scheduling maintenance or reducing CPU power usage to allow continued operation – to be taken in advance, thus preventing potential system failures.

Ticketing systems and other self service terminals focus on sophisticated embedded security features including intrusion prevention. With SEMA Cloud, all relevant information such as memory condition, networking status, board ID and intrusion detection status can now even be monitored remotely via clouds. This helps operators - even with tight budgets - to add additional monitoring features to improve operation.

In Industrial 4.0 applications, any unscheduled downtime can result in massive production losses. Remote monitoring of the application via SEMA Cloud can help to prevent downtimes by additional real time monitoring of the environmental conditions via the on-board SEMA BMC and also peripherals like S.M.A.R.T data of storage media as well as system temperature and power alerts, enabling continuous 24/7 system operation.

By pushing system condition as well as operational and environmental data to the user cloud server via any kind of TCP/IP connection — such as 3G/4G, LAN or wireless

LAN — system operators have easy access to data and analytics through web browsers or a web application programming interface (Web API), using devices such as a desktop PC, tablet or smartphone, or using data analytics systems. SEMA Cloud manages not only the device data but also allows users, for example, to throttle CPUs, access I2C bus connected sensors, upload and download files for software updates or downloading device data for analysis. A special feature is the possibility to securely perform remote firmware updates. By means of so-called campaigns, such actions can be performed remotely parallel on many devices, significantly reducing field maintenance costs.

Operators can verify, monitor and manage system performance at any time from a single, central location, improving reliability and reducing management costs.

To enable communication between SEMA Cloud and the devices, all the new ADLINK Computer-on-Modules feature the intelligent SEMA Agent. It consists of the dedicated hardware-based board management controller for local data management and encrypted communication with the cloud as well as corresponding middleware. The SEMA management controller not only provides all relevant status information; it even allows remote man-

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agement of the board and application-specific peripherals, such as power states or watchdog setting. The middleware provides a large set of deeply embedded tools enabling remote device and system management via the SEMA Cloud platform and management portal or custom-specific clouds and services.

ADLINK offers its customers SEMA Cloud Evaluation Packages, which include licenses to use the SEMA Cloud for one year and cover connections of up to 10 or 50 devices for test and development purposes. Customers can easily enter the new exciting world of IoT and test and develop their own IoT solution with reduced time-to-market (TTM) and without the need for large investments in new IT infrastructure. Thus, SEMA Cloud enables customers to reduce maintenance costs of their embedded systems and to monetize their data in a short period of time.

With its A+ Services ADLINK also offers the entire development of carrier boards for its COM Express Computer-on-Modules. This includes system integration from concept to volume production to reduce development costs and shorten time-to-market. Many years of development experience and extensive expertise in the area of Computer-on-Modules and carrier board development are the guarantee for delivering highest quality within a very short time. Fitted with the latest technical equipment, the company test labs carry out the verification of the designs to ensure conformity with form factor specifications and relevant interface standards by appropriate compliance tests. Tests include, for example, power integrity, signal integrity, thermal simulation and mechanical stress tests. To streamline the processes from development to series production and to ensure highest qual-

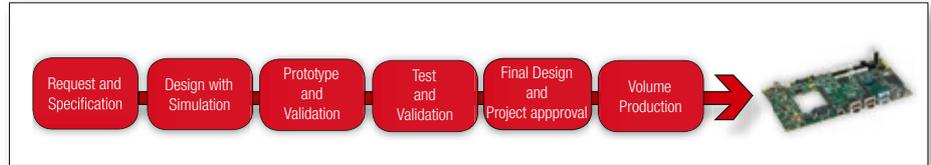


Figure 2. Seconding A+ Services for Computer-on-Modules transform the product vendor ADLINK into a real ODM service provider for OEMs offering full custom design services on board and system level.

ity levels, ADLINK follows a well-established process. Six process steps transform a customer order into a volume-ready product to be assembled on latest SMT production lines.

For OEMs it is important to be able to rely on open standard building blocks to build system platforms that are tailored to the dedicated needs of customers and which quickly bring new applications to market. With sixth-generation Intel Core processors on COM Express Computer-on-Modules they have the right solution to cover nearly all the x86 performance classes. The ADLINK A+ services include the design and production of the entire solution and the responsibility for the entire system with a single point of contact. By providing its A+ Services the company fills this gap and is transformed from a pure embedded platform vendor into a true end-to-end service for OEMs. The new cExpress-SL and Express-SL in PICMG COM.0 Type 6 Compact and Basic size form factors are available with sixth-generation Intel Core i7, i5 or i3 processors and the accompanying Intel QM170 and HM170 chipset. In addition, the Express-SLE COM Express Basic size module features the Intel Xeon processor E3-15XX v5 family and Intel CM236 chipset and supports ECC memory. In all models, a total of 32GB DDR4 memory at 1867/2133MHz is supported with increased I/O frequencies and

lower voltage compared to DDR3 resulting in higher data transfer rates as well as reduction in overall power consumption and heat dissipation. These new COMs support three independent UHD/4K displays and hardware codec H.265/HVEC with Intel Gen9 graphics, making them well-suited for image-intensive applications in automation, medical, infotainment and gaming. Models with an extended operating temperature range of -40°C to +85°C are also available for transportation and defense applications.

Latest sixth-generation Intel Core processor-based COMs from ADLINK also provide flexible system integration with configurable TDP (cTDP), which allows developers to modify processor behavior to the extent that power consumption and TDP can be adapted to meet application demands. The 15 watt Intel Core processor U Series can, for example, be configured down to a 7.5 watt TDP, and the Core i5 and i7 SKUs additionally up to a maximum TDP of 24.5 watts. One Intel Xeon processor even has a cTDP that ranges from 35 to 45 watts and addresses the demand of space-restricted embedded server technology required for the IoT edge infrastructure. The rich I/O set includes three DDI channels, one LVDS (or 4 lanes eDP), up to 8x high-speed PCIe Gen3, four SATA 6 Gb/s, GbE, four USB 3.0 and four USB 2.0. ■

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C/C++ Development Kit Available

The flexible platform for IoT applications

By Adrian Bertl, and Roland Peindl, b-plus

This article introduces the GATEBox 100 which can aggregate, share and filter data for analysis purposes in the emerging Internet of Things applications.



■ An astonishing estimation: in 2020 more than 200 billion devices will be connected to each other. Connectivity reigns and by realizing the power of the IoT the main point is the use of the data provided by these connected devices. The ability to share data is based on intelligent gateways, which unlock these borders and enable companies to seamlessly interconnect industrial infrastructure devices and secure data flow between devices and the cloud.

Connecting a device to the internet or with a cloud solution, there are a lot of industrial PCs on the market that could support you with this functionality. But it is not easy to find out which one of this big variety matches in your individual system. To find out the difference between all these industrial PCs is already a question of engineering. Buy or build? – Specific interfaces and functions decide the right connection for the needed application. In most existing infrastructures the basis is a data source and most likely an interface, like analog or digital I/O or bus interfaces like CAN, to connect to.

Most standard IoT gateways offer standard PC interfaces for a simple IoT connectivity. When it comes to more industrial interfaces the variety of standard products are less and often it's hard to find GPIOs or CAN Bus on

these gateways. So most developers have to decide if they build a second industrial PC with the interfaces they want to connect to the cloud. The other option is that they build and qualify a whole new industrial PC with IoT gateway functionality and at the end they are reinventing the wheel to face two applications in one single box.

Knowing this challenge from customers b-plus developed an IoT gateway which is a perfect compromise between building a whole new industrial PC and having an extra box for interface connectivity. The GATEBox 100 is a Box PC with flexible I/O shields, called Smart I/O Driver Interface (SIODI). Because of this concept it is possible to implement additional interfaces without developing something whole new. It is irrelevant if you need additional analog/digital in- and outputs, field buses like CAN, Audio or customer-specific I/O cards. There are already predefined options including scalable CPU Power.

The base configuration of the Industrial PC with only 15cm width, 5.8cm height and 9.5cm length brings data acquisition and communication together. The standard version with two Gigabit Ethernet interfaces provides two physically separated networks for the setup of firewall applications. Furthermore the standard box provides two USB 2.0,

one HDMI connector and also two DSUB9 connectors with variable RS232/RS485/CAN options.

But how can you make sure that the industrial PC includes the perfect balance between computing power and power consumption in your application? With respect to the specific operating conditions or for software reasons it is important to choose the fitting computing platform. For this reason the GATEBox 100 is based on SMARC CPU Modules which offer various performance classes and architectures. So it can be equipped with Freescale i.MX6 series (ARM) as well as x86 solutions like Intel Quark X1000 or Atom E38xx series. For the future product life cycle the next generation of processor module can be used with the same box.

To specify your requirements this industrial PC is equipped with a special interface area where custom interfaces can be added. With the flexible SIODI (Smart I/O Driver Interface) shields of the GATEBox 100 the system designers are able to be configured to an individual system rapidly. With a special system service, called SIODI service, the I/O data becomes available in the OS. SIODI service is capable of multi instances. So you can connect to the hardware SIODI I/O shield via various software instances. For example, you can real-



Figure 1. Standard GateBox with 2x GB with 1x RS232, 1x RS485



Figure 2. SIODI S1 with 2x CAN, 4x digital/analog Input, 4x digital Output, 1x RS422



Figure 3. SIODI S2 with analog Audio, S/PDIF, 1x USB



Figure 4. SIODI S3 with 4x digital Input, 4x digital Output, 4x analog Input

ize a logging application that runs 24/7 and in parallel you can have a separate maintenance software, which can grab the data from the same sources or configure the I/Os. Having the I/O data in the OS you can include the SIODI API directly in the application and connect it to the cloud – without any extra way regarding the shield functions. The flexible Industrial PC offers four SIODI Shields for different markets and also allows 300 other configuration possibilities. Because of the wide-ranging

I/O portfolio various applications can be realized with the configurations. For special interfaces the opportunity is open to build an own I/O shield according to the SIODI interface standard. One key aspect is the connectivity, because getting the data available in the cloud is the main goal of an IoT gateway. The GATE-Box 100 has options for wireless connections, like WWAN, WLAN or LTE, up to the cloud and options like CAN Bus or Digital I/O for the connection to sensors and the machine. In

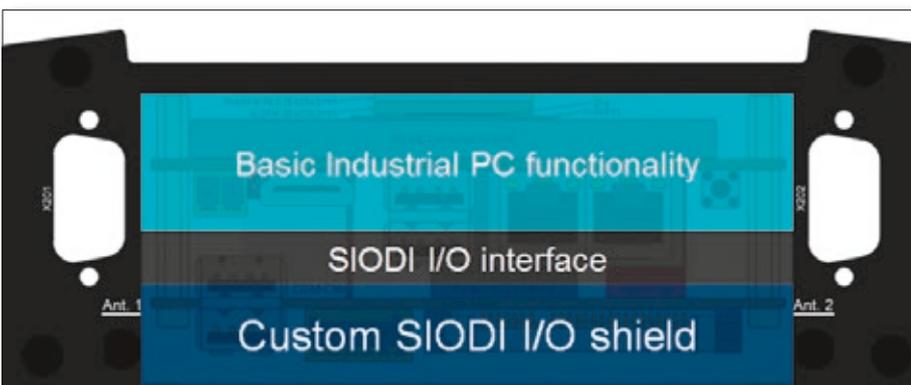
real time and measurement environments you like to get machine or sensor data within temporal correlation between different machines. GATEBox offers a CTSS option where the Ethernet Port utilizes IEEE1588/802.1AS to synchronize the time within a network. With this time sensitive networking option (TSN) you are able to acquire sensor data from different data sources e.g. more GATEBoxes and can send this data to the cloud for analytics.

A lot of companies are already using industrial PCs for intelligent communication between their machines. Most of the industrial PCs are developed for installation in air-conditioned cabinets and run 24/7. But what happens with applications in harsh environments? What about all the systems that must endure fluctuating temperatures or voltages, like infrastructure or outdoor applications?

Especially for these requirements the GATE-Box 100 is developed: it is a robust, small but powerful industrial PC which meets all the challenges in outdoor operation maintenance-free. It even ensures reliable operation in an operating temperature down to -40°C, most suitable for use in cabinets outdoors. In order to meet the requirements of industrial applications a 24/7 endurance runner was created which is completely maintenance-free. The industrial PC needs no fan, no battery and also no moving parts. The passive cooling concept, super caps and industrial 2.5” or M.2 SSDs guarantee reliable operation and reduce the service cost. In some environments you may also get voltage fluctuations. With standard PC hardware you will get undefined states or reboots of your PCs. To avoid this the GATEBox has a 6.5 V – 32 V DC wide range input. To bring existing applications to an IoT infrastructure it is necessary to find a good spot to mount gateways. Thus GATEBox offers various mounting options which round up the package enabling operation in the standard desktop version, mounted on the wall or DIN rail.

The complexity of industry systems increase the probability of a system breakdown. With machines, that are not connected the service technician has to do on-site service, even if a reboot of the machine would solve the problem. With an IoT gateway he can see the status of the machine and do a reboot from remote. Since the gateway itself isn't part of the machine itself it will stay on-line and can monitor the reboot. As a consequence the GATEBox 100 opens up the use of hidden data for remote diagnostics.

Reducing machine downtimes: when an industrial machine has broken down debugging the error could take long time. Such a problem doesn't exist with the use of GATE-



Schematic Setup of GATEBox 100 with the SIODI concept

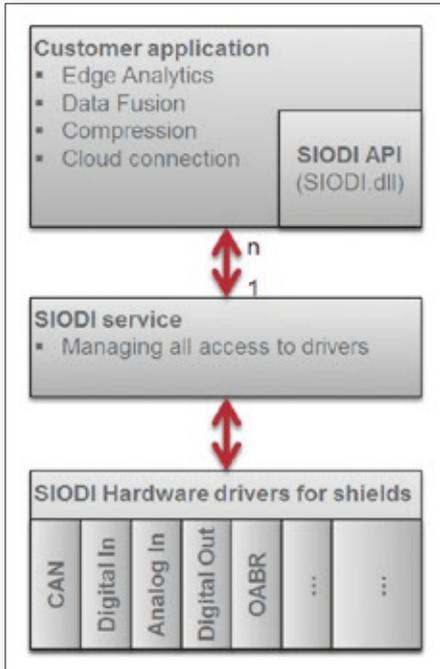


Figure 5. SIODI software architecture

Box, because it is a stand alone system which can monitor the whole system health. The occurring errors or log files can be analyzed in laboratory for eliminating further failures. The existing data base of industry PCs together with corresponding evaluation and

analyze tools make the system complete and support a trouble-free function and maintenance of Industry 4.0.

Aggregating the data available is the main target of an IoT gateway – but there has to be a complete solution with a framework. Taking a deeper look is key for getting the data into a complete framework and back-end with databases and analytics, where you can start and improve your IoT intelligence. Commands can be sent directly to the machine via CAN or GPOs. Nodes can be managed, updated and addressed or configured by the framework. GATEBox 100 seamlessly integrates into existing IoT frameworks and enriches the complete system with enabling new data.

System design and their components – the right view to match industrial needs with right solutions is based on profound experience in embedded computing. To rely on the system without taking care about maintenance, failures and standardizations of industrial PCs keeps on track for core competences and avoids long internal development cycles. Having the final application in mind b-plus develops robust hardware from prototype to production. Nowadays the hardware has to face environmental requirements while being precision-tailored to individual needs. ■

Embedded World News

Hall-Stand 1-221

● Axiomtek: secure your industrial networks with robust industrial firewall

Axiomtek has launched IFW330, an integrated industrial 3-port firewall with NAT/VPN/router all-in-one designed to keep your automation networks safe and secure. As we enter the era of IoT, the rise in cyberattacks in industrial appliances as resulted in cyber security becoming a central concern amongst industrial automation and control system users and vendors.

[News ID 3794](#)

Hall-Stand 5-209

● EKF: peripheral slot card for CompactPCI Serial systems

EKF introduces the SD3-GLISS, a peripheral slot card for CompactPCI Serial systems, equipped with a quad-channel PCI Express to SATA 6Gbps controller, and four on-board sockets for mSATA solid state drives. With a capacity available of up to 1TB as of current, mSATA is a popular embedded storage module form factor.

[News ID 3792](#)

Hall-Stand 2-311

● IEI: Tablet PC certified by Microsoft Azure IoT

IEI announce that the ICECARE-10W is the first table PC to be certified by Microsoft Azure for Internet of Things, ensuring customers get IoT solutions up and running quickly with hardware and software that have been pre-tested and verified to work with Microsoft Azure IoT services.

[News ID 3870](#)

Hall-Stand 1-554

● ADL: Intel E3800-series, industrial IoT-ready 3.5-inch SBC

ADL Embedded Solutions has announced its ADLE3800HDC 3.5" SBC. The ADLE-3800HDC is based on Intel's first System-on-Chip E3800-series Atom processors which use Intel's 22nm 3D Tri-gate process. It offers vastly superior compute performance and energy efficiency and Intel's 7th generation graphics engine for stunning graphics performance. Improved power management capabilities result in standby power measured in milliwatts with days of standby time.

[News ID 3799](#)



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The 6th Generation Intel® Core™ Processor Embedded Boards

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ECM-SKLH
6th Gen Intel® Core™ Processor i7/i5/i3 3.5" Micro Module with Intel® QM170 Chipset

EBM-SKLU
6th Gen Intel® Core™ SoC Processor i7/i5/i3 5.25" Mini Module

intel IoT Solutions Alliance



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Hall-Stand 1-221

Axiomtek: Celeron-based 2-slot fanless Embedded system

Axiomtek has launched IPC922-215-FL, an energy-efficient fanless 2-slot industrial system with rugged mechanism and optimized expandability. The extreme compact IP30-rated IPC922-215-FL utilizes an onboard Intel Celeron quad core processor J1900 2.42GHz with one DDR3L 1333 up to 8 GB memory. To fulfill difference application needs, the rugged Intel Bay Trail SoC barebone embedded system provides great expansion capability with two flexible PCI/PCIe slots that can be customized.

[News ID 3847](#)

Hall-Stand 1-554

ADL: rugged, MIL-STD 810 removable 2.5" SATA drive

ADL Embedded Solutions announced its new ADLRHD-1650 removable hard drive sub-assembly. The ADLRHD-1650 has been developed for military and industrial use scenarios that can benefit from MIL-STD 810 shock and vibration durability but also requires frequent SATA drive removal or swapping for data retrieval, maintenance, security and other purposes.

[News ID 3804](#)

Hall-Stand 4A-101

Mouser: BeagleBone Green Dev Board now shipping

Mouser Electronics is now stocking the highly anticipated BeagleBone Green, a Linux-based development board from BeagleBoard.org and Seeed Studio. The BeagleBone Green updates the popular BeagleBone Black, retaining the AM335x 1GHz ARM Cortex-A8 processor from Texas Instruments. Rather than keeping the BeagleBone Black's HDMI connector and chip, the Beagle-Bone Green contains Seeed Studio's plug-and-play Grove connectors. With this new board, Seeed Studio looks to help developers and designers capitalize on Seeed's modular Grove system and the board's general purpose I/O expansion capabilities.

[News ID 3638](#)

Hall-Stand 2-340

Portwell: PICMG 1.3 SHB with latest Intel Xeon and Core processors

Portwell announced the ROBO-8113VG2AR, a PICMG 1.3 System Host Board (SHB) offering a choice of the latest 6th generation Intel Core i3 processor product family or the Intel Xeon processor E3-1200 v5 product family. The Intel Xeon processors include Intel Turbo Boost Technology 2.0 and Intel Hyper-Thread-

ing Technology to deliver improved performance and processing efficiency. Portwell's ROBO-8113VG2AR implements flexible PCI Express Gen 3 expansions with a choice of one PCIe x16, two PCIe x8, or one PCIe x8 and two PCIe x4 with dedicated processor SKU, which is ideal for a range of applications, such as Industrial Automation, Digital Signage and Medical.

[News ID 3854](#)

Hall-Stand 2-218

Advantech: 10.4" industrial multi-touch display kit

Advantech announces the launch of IDK-1110P 10.4" industrial multi-touch display kit. Advantech IDK-1110P features a 1024 x 768 high definition display for better visual performance and is designed with Project Capacitive Touch technology that allows up to five-point simultaneous touches for smooth operation. This 10.4" display kit extends the benefits of the current IDK series, providing cost-effective display solutions with proven compatibility with Advantech embedded boards and systems. IDK-1110P can be used for edge-to-edge applications, making it ruggedized and easy to maintain.

[News ID 3721](#)

Advertorial



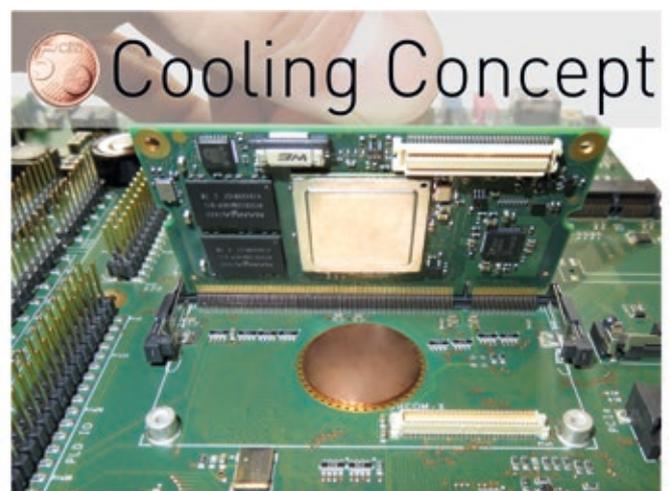
CoM/SoM - 5 Cent Cooling Solution – Without Heatsink!

Thanks to the new "5 Cent cooling concept" for DH's ARM based COM/SOM, heatsinks can be dismissed.

Save time and money

You can save time and money using the new DHCOM cooling concept. You only need a copper pad and some thermal paste.

The heat will be derived via copper plate and thermal-vias to the inner layers of the mainboard, so that there won't be any damage to the elements on top. The copper pad is no larger than a 5 Cent coin.



Features

- Easy to customize in baseboard design
- The 5 Cent cooling is used for DHCOM i.MX6 Dual-Core and i.MX6 Quad-Core.

DH electronics
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Always reliable. Always ahead.

CompactPCI Serial Handles 16 Cores for Computing and Virtualization

Which standardized platform – if not CompactPCI Serial – would fit better to play out the strengths of the high performance Intel Xeon D or QorIQ multi-core CPUs? MEN presents two new enhanced network CPU cards with Intel Xeon D and Freescale QorIQ processor. One of them is called G25A and convinces with its up to 16 independent cores, 32 GB DDR4 DRAM with ECC, high-performance data transfer lines and built-in hardware virtualization.

Gimme the data: 10 Gb Ethernet and PCIe 3.0

Based on the new Intel Xeon D-1500 processor, the G25A is the first CompactPCI Serial SBC from MEN which supports two times 10 Gb Ethernet on the front as well as PCIe 3.0 via the backplane. This enables a smooth handling of high data volumes.

The versions of G25A with 4, 8 and 16 cores provide concentrated computing performance and are at the same time the basis for virtualization applications. The required abstraction of software from hardware is achieved by the CPU's built-in hardware virtualization support, the organization of the 32 GB DDR4 RAM and the scalability of the G25A standard models.



All components are by default firmly soldered and guarantee shock and vibration resistance. A Trusted Platform Module (TPM), a board management controller and a watchdog ensure safety.

The G25A und G52A are complemented by a third new card - a cost-effective PCIe Gen 3 switch. Some typical industrial applications include multi-CPU high speed video and image processing, supercomputing and high performance routing.

MEN Mikro Elektronik GmbH
<https://www.men.de/products/g25a>

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Mini-ITX form factor WADE-8017 utilizing the 6th generation Intel® Core™ processors

The new WADE-8017 is designed for high performance and flexibility in functional expansion, and is ideal for applications in gaming, kiosk, digital signage, medical/healthcare, defense and industrial automation and control.

Portwell's WADE-8017 offers many features, including support for the SATA-3 with RAID 0/1/5 and 10 modes, the latest PCIe 3.0 (one PCI Express x16 slot), Dual GbE, 6 USB ports (four USB 3.0 ports on rear IO and two USB 2.0 pin headers on board), as well as 2x DDR4 SDRAM for up to 32GB, and up to three independent displays (VGA, HDMI and DisplayPort).

In addition to mainboards, Portwell offers also COM Express, Qseven and SMARC modules, fanless systems and PanelPC's for your OEM application. Please check out our website for more information.



Features

- Intel® Core™ i7/i5/i3 on LGA1151 with Q170 chipset
- 6 SATA-3 ports, 3 independent displays (DP, HDMI, VGA)
- 2 GbE, 4 RS-232 ports, 6 USB ports
- 1x PCIe x16 Gen3
- 1x M.2 type E socket, 1x Mini-PCle

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HMI-3571 - Intelligent HMI Platform

Easiely customize HMI solutions with integrated IEC 61131-3 PLC, Modbus and CANopen

HMI-3571 is the compact and modular Linux based touch panel display with integrated higher layer software for control and communication. The internal design of the HMI-3571 strictly separates core electronics from electromechanical parts like connectors, buttons, LED, LCD and touch screen. This approach simplifies adaptation to new enclosures and customization dramatically. The highly compact core electronic provides board-to-board connectors for all peripherals and interfaces. Thus, connectors, LCD, touch screen, buttons and LEDs can be placed independently and highly customized into own HMI designs, without touching the core electronics. The HMI-3571 core electronics supports various display resolutions as well as resistive or capacitive touch. GPIO signals are available to implement buttons and LED indicators. Serial port, CAN-bus and Ethernet communication is available as well.



Upgrade your HMI with control functionality using the integrated IEC 61131-3 PLC runtime kernel. The on-board visualization supports GUIs displayed locally and via Web-Interface. Fieldbuses like CANopen and Modbus are supported. Alternative you may also choose to write your application code in C/C++ or C# based on the Qt framework.

Features

- NXP i.MX357 with 64 MiB DDR2-SDRAM and 128 MiB NOR-Flash, Micro-SD card interface
- TFT with resistive or capacitive touch in different resolutions connectable
- CAN, Serial and Ethernet
- CANopen and Modbus integrated
- Programmable in IEC 61131-3, C/C++ and/or C# language
- Target-optimized Linux OS with real-time extension

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Rugged Embedded Solutions for Industrial Applications

The SYS-405 series of industrial computers utilizes the Intel® Atom™ E3800 family of processors in a tough aluminum enclosure. The rigid enclosure is engineered for rugged applications and provides the thermal solution for the processor. The 5052 aluminum alloy enclosure protects the PCB assembly and includes access to the CFAST connector.

Linux, Windows, and other x86 operating systems can be booted from the CFAST, mSATA, or USB interfaces, providing flexible data storage options. WinSystems provides driver for Linux and Windows 7/8, as well as pre-configured operating systems.

WinSystems has modeled excellence in the embedded industry for over 34 years by providing the highest quality products, service, and support. Come visit us in Hall 2 #644 to see innovative systems, ARM solutions, PC/104 boards and more.



Features

- Multi-Core Intel Atom E3800 Processors
- Up to Two Independent Displays (VGA and DisplayPort)
- Two Ethernet Controllers with IEEE 1588 Time Stamping
- Two RS-232/422/485 Serial Ports
- Internal Bus Expansion (MiniPCIe)
- Four USB Ports (1xUSB 3.0 and 3xUSB 2.0)
- Bootable SATA, CFAST, mSATA
- Wide Range 10 to 50V DC input
- Fanless -40o to +85oC Operational Temperature

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 Hall 2 / Stand 2-664

SoC processors enable COM Express modules from 12W up

By Christian Eder, congatec

With the launch of the first SoC variant of the AMD Embedded R-Series processors this high-end class of desktop processors has also become available for embedded applications. For the first time and thanks to their scalable TDP from 12W upwards, they can now even be used in fully enclosed, fanless systems. congatec supports the new processor platform on COM Express computer modules.



Figure 1. The conga-TR3 computer module from congatec comes equipped with a 12-35W AMD Embedded R-Series processor. Providing high-performance SoC graphics and HSA 1.0 support, it can theoretically yield up to 75% more performance per watt.

■ AMD Embedded R-Series SoC processors predecessors combined the CPU and GPU on a single die to an APU (Accelerated Processing Unit). The new System-on-Chips (SoCs) now also integrate the platform controller hub (formerly Southbridge) which makes board designs significantly more compact and energy efficient. The new CPU cores provide around 5% more performance while requiring approximately 40% less energy. At the same time, the scalability of the TDP is extremely wide, ranging from 12W to 35W. When configured for 12W to 15W, they can now be used for the first time in fully fanless designs.

Besides high-performance embedded computing, this opens new applications for the AMD Embedded R-Series in areas that demand extreme robustness or a high degree of system safety. For instance, fully enclosed systems are a must in clinical applications that require the highest standards of hygiene. In the industrial environment, protection from dust and dirt is important. Low maintenance is another important aspect that speaks for fanless systems. So there is a multitude of applications where AMD Embedded R-Series processors have become a viable option for the first time. In many cases, the arguments for the AMD Embedded R-Series are the same as in the higher performance range where fans are always required. It is primar-

ily the high-end embedded applications that benefit from the embedded high performance AMD Radeon graphics, or applications that use AMD support of OpenCL and the Heterogeneous System Architecture (HSA) to their competitive advantage.

The processors are therefore used in applications that require a particularly powerful, highly integrated graphics and/or parallel processing power. Examples can be found among high-end gaming, e.g. digital pinball and arcade machines, in demanding digital signage installations with large 4k displays, as well as image and video analysis in industrial vision systems and medical imaging technology. Other applications that benefit from the high GPGPU performance of the new processors include security applications such as video surveillance with face recognition, network firewalls with deep packet inspection, or IoT systems with integrated big data analytics. Let's look at the specific improvements that have been achieved over the previous APU.

While the competition continues to implement its processors as multi-chip modules, the AMD Embedded R-Series is the first SoC design in the x86 high performance segment to integrate GPU, CPU and I/O controllers on a single die. AMD has used this higher level of integration to optimize energy efficiency

and reduce power draw. The CPU is based on the new Excavator architecture where two x86 cores share one L2 cache, just like R-Series APU designs. In addition, some functional units have been optimized to save space. For example, the floating-point scheduler, the fused multiply accumulate (FMAC) units as well as the instruction cache has all been compacted to lower energy consumption.

AMD has also refined the power management featured in earlier CPUs and GPUs. Each Excavator core uses 10 so-called adaptive voltage scaling frequency (AVFS) modules. They optimize the voltage and clock rate of the individual functional units, so that each core can utilize the existing power and thermal budget to the maximum. Yet the top TDP of the SoCs remains the same as that of previous APUs - despite the integration of the Southbridge that consumes a significant 7.8W (i.e. 22% of the maximum TDP of 3W) in the shape of the fusion controller hub A75.

At the same time, it has increased the performance of the Excavator architecture. Overall, it provides 5% more instructions per clock cycle at 40% less power and 23% smaller die area compared to its predecessor Steamroller and therefore offers significantly more performance per watt. When calculating the performance increase per given watt, a the-

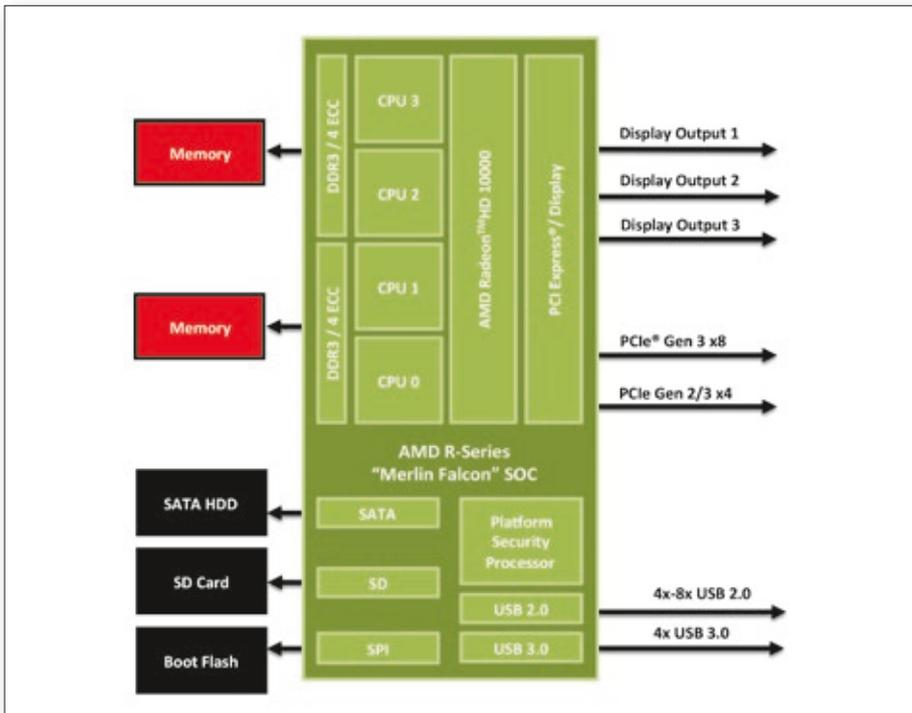


Figure 2. The AMD Embedded R-Series SoCs integrate CPU, GPU and I/O controller. Thanks to architecture optimizations CPU power draw has been reduced to around 57% without loss of performance.



Figure 3. High-end performance compacted down into 125x95mm: congatec-TR3 computer module with active heatpipe solution mounted on a carrier board.

oretical increase of up to 175% ($100\% \cdot 100 \text{ watts} / 60\% \cdot 1.05 = 175\%$) is possible – that’s an enormous performance boost per given watt. Under these circumstances, it would be possible to change designs using first generation APUs into fanless 15W implementations without loss of performance. The improvements don’t stop at the CPU; the GPU is also new. The integrated AMD Radeon HD 10000 graphics is now based on the third generation of the Graphics Core

Next (GCN 1.3) architecture. The Radeon HD 10000 provides up to 8 compute units with 64 execution units each. This adds up to 512 execution units, offering application developers yet more graphics performance with the latest DirectX 12 and OpenGL 4.4 3D features. This makes the new SoCs suited for applications that require game console level graphics performance on up to three screens. At the same time, developers can use the AMD Radeon HD 10000 graphics for GPGPU tasks.

Thanks to full support of the recently adopted HSA specification 1.0, this is now even easier. HSA unifies how programmers address the relevant computing units by dismantling the programming barriers between CPU and GPU and minimizing latencies in the communication between CPU and GPU with a single memory interface. HSA allows programmers to develop applications that make optimal use of the respective CPU and GPU advantages. With HSA, the individual workloads of the AMD R-Series SoCs are automatically processed by the most suitable computing unit, leading to the best possible performance and lowest power draw. The single memory for CPU and GPU speeds up the communication between the two computing units.

The memory therefore has a big impact on overall performance. By supporting high-bandwidth DDR4 RAM with ECC, the SoC meets even the requirements of data-critical server and big data applications. DDR4 RAM is also around 20% more energy efficient than the previous DDR3 RAM, which has an additional positive effect on the performance and power consumption of the overall system.

For the effective handling of multimedia data, the SoCs feature a new integrated Universal Video Decoding Unit 6 that supports the current 4K HEVC/H.265 video codec and can decode 18 1080p video streams compressed in H.264. The video compression engine (VCE) has also been improved and in version 3.1 it can compress up to 9 full-HD video streams in H.264 for video-rich applications.

In addition, AMD has integrated a platform security processor (PSP) which incorporates a hardware-based RSA, HSA, and AES encryption along with a true random number generator. Thanks to this additional security engine and a TPM developers are able to implement the highest levels of data and communication security in their applications. This is particularly crucial to protect safety critical IoT and communications applications from data exfiltration and manipulation. On the I/O side, the new SoCs are also state-of-the-art, providing PCI Express Gen 3.0 and USB 3.0. This feature set makes them suited for COM Express implementations that realize the SoCs full potential with the Type 6 pinout.

The first three congatec COM Express Basic modules with AMD R-Series processors are available with either one of the two 2.1 GHz / 1.8 GHz quad-core AMD Embedded R-Series processors (RX-421BD / RX-418GD) or a 1.6 GHz dual-core processor (RX-216GD). The COM Express Basic form factor is suited for this generation of processors. Not only does it provide an area of 125x95mm that is adequate

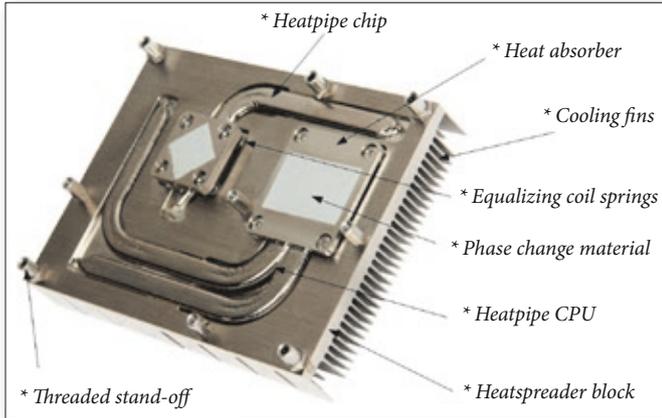


Figure 4. Patented congatec cooling solutions with particularly flat heatpipes ensure that the conga-TX3 module stays cool even when powered with 35W.

for the required heatsink design, it also offers two double-row SMD connectors with 440 pins for numerous high-speed interfaces. In addition, COM Express is optimized for the high-performance interfaces of standard PCs and meets even the most extreme ruggedness requirements thanks to its stable connection to the application-specific carrier board. Therefore, COM Express is often the preferred solution for high-end embedded designs with custom interface sets where the standard feature set of Mini-ITX motherboards is inadequate or application space limited.

Individual system designs always present the embedded design engineer with some challenging questions: Is my system design really suitable for the chosen processor? Will I be able to operate the system long-term and without overheating, or will the application bring the system down when it comes to load peaks? It is key to ensure that the design does not overheat the processor, as this would shorten the service life or lead to extremely premature failures. Fortunately, there are now not one but two factors that make it easier for developers to balance hardware design, processor and application requirements. The first factor is the configurable TDP of the processor. The second factor is the availability of fanless cooling solutions that are a good fit for the computer module and processor. They make it possible to optimize the design step by step to the requirements of a given hardware design and application. The new SoC processors are configurable from 12W to 35W. If the application is prone to overheating the system in certain scenarios, it is possible to minimize the hotspot at certain points by limiting the maximum heat output so that the system always remains within the permitted thermal range. Another option is to play with heatsink variants, provided different cooling concepts are offered for an identical footprint. Since the PICMG COM Express specifications allow designers to limit the height of the heatspreader it is possible to develop heatsink solutions with an identical footprint that offer different options. These can range from simple embedded heatsinks with fins to heatsinks with a housing connection, high-performance coolers with combined heatpipe and heatspreader technology, or integrated active coolers.

The availability of configurable TDP together with starter kits that offer flexible heatsink variants will enable system developers to succeed more quickly than with trial & error attempts at system design and housing. The new AMD R-Series processor generation makes thermal design a lot easier. However, OEM developers will continue to face questions that require direct access to the expertise of module suppliers. It is then a real advantage if the manufacturer has defined a transparent process that guarantees personal support, making it unnecessary to go from pillar to post and explain issues again each time. ■

Intel® New Generation Xeon® Processors



PCOM-B634NG



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IoT Solutions Alliance

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LV-67S



Qseven 2.0, Pico-ITX, 3.5" Miniboard
QE-E71, LP-174, LE-37E
5th Gen Intel® Core™ i7/i5/i3



Qseven 2.0, Nano-ITX, Mini-ITX
QE-E70, LN-D70, LV-670
Intel® Celeron® J1900, N2930 & Atom™ E3845



PICMG 1.3 Half-size, Full-size
HE-B71, FS-A78
4th Gen Intel® Core™ i7/i5/i3



Micro-ATX MB
ME-C79, MS-C78
4th Gen Intel® Core™ i7/i5/i3



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Hall-Stand 1-260

S.I.E.: multimedia player for digital signage is long-term available

With an overall height of just 19.5 mm, the boxm from S.I.E. is designed as an ultra-thin multimedia player for digital signage applications. Two HDMI outputs are available for two different image signals, which are played back smoothly and in high HD resolution through the integrated Intel graphics. Thanks to the use of a modern Intel J1900 Quad-Core CPU which is available long-term at up to 2.42 GHz, the device can be produced unchanged for many years. The large working memory of 4 GB of RAM as well as a 64 GB SSD installed as standard support large LINUX or Windows installations. The fanless design in closed, full metal housing allows for reliable operation in a wide range of temperatures from 0° to 45°C. Three USB interfaces (1x USB 3.0 and 2 x USB 2.0), a serial interface and audio jacks for Line in and Line out round out the product. The power supply is provided by an external 12 V DC direct current source.

[News ID 3836](#)

Hall-Stand 1-501

Wynmax joins Litemax group

WynMax will join hands with Litemax Electronics to form a new family. Litemax located in Taipei Taiwan was founded in 2000. Its expertise lies in hi-brightness LCD panel and display module's application platform, Durapixel LED backlight modules and special cut size panels.

[News ID 3623](#)

Hall-Stand 1-639

Toradex Community provides extensive free and direct technical support

Toradex announces the launch of its latest technical support feature, the Toradex Community, an online community that aims to provide customers a unique platform to stay connected with the Toradex engineers.

[News ID 3745](#)

Hall-Stand 1-418

Concurrent: ExpressFabric switch enhances 3U VPX portfolio

Concurrent Technologies announces FR 341/x06, a new 3U VPX ExpressFabric switch. FR 341/x06 supports six payload boards and is based around an Avago Technologies PEX9700 series device which is fully Gen 3 PCI Express compatible with additional ExpressFabric capability. Similar to Concurrent Technologies' existing FR 331/x06 3U VPX switch, it provides PCI Express data and Ethernet control plane links but with the advantages of higher performance and more flexible configurations to suit a myriad of system topologies.

[News ID 3850](#)

Hall-Stand 5-158

u-blox: M8 multi-GNSS platform now supports Galileo

u-blox announces the release of a new firmware, FW 3.01, for its u-blox M8 concurrent multi-GNSS platform. u-blox M8 FW 3.01 now also supports Galileo, in addition to GPS, GLONASS, BeiDou, QZSS and SBAS. It can track up to three constellations concurrently and makes use of all SBAS and QZSS augmentation systems at the same time. With Galileo fully deployed, the European positioning system will provide access to 24 additional satellites, thereby significantly increasing availability of GNSS signals and further improving position accuracy in challenging urban environments.

[News ID 3864](#)

Hall-Stand 1-306

Silex acquires embWiSe Technologies

Silex Technology announced a definitive agreement to acquire embWiSe. embWiSe is a successful India-based company bringing expertise in Wi-Fi technologies and is a Qualcomm authorized design center. The addition of embWiSe will further Silex Technology's focus to assist customers in embedded wireless enablement. Silex Technology is a global leader in reliable Wi-Fi connectivity for products ranging from a medical device to a document imaging product to a video or digital display.

[News ID 3845](#)

Hall-Stand 1-521

DFI: 6th gen Intel Core processor-based COM Express type 6 module

DFI introduces its latest three COM Express Type 6 modules powered by the 6th Generation Intel Core processor family, including Intel Mobile-based Basic – SH960-QM170 and SH960-HM170, and U series SoC-based Compact – SU968. The Mobile-based modules features enhanced graphics performance and high computing while ULT-based module features low power and fanless design making them well suited for industrial application in gaming, medical, digital signage, and factory automation.

[News ID 3761](#)

Hall-Stand 2-218

Advantech: SQFlash with Intel Security solution for enhanced security

Advantech announce a collaboration with Intel Security to integrate McAfee anti-virus into Advantech's Industrial Storage—SQFlash Security Package. Advantech SQFlash includes industrial SSD, CF cards, and multiple form factor storage; all empowered by comprehensive security features such as Flash Lock, Security ID, and Emergency Erase.

[News ID 3852](#)

Hall-Stand 1-310

AAEON: Micro-ATX line leverages 6th gen Intel Core CPU for massive enhancements

AAEON leverages 6th gen Intel Core CPU technology in bringing massive enhancements to the IMBM-Q170A industrial motherboard, the first entry in the company's Micro-ATX product line with the new chips. Powered by the S-variant of the processors, the new chips now grant the board support for more voluminous and advanced memory, namely the DDR4 memory, with the maximum capacity of 64 GB (divided among 4 RAM slots). The memory itself features faster transfer speeds while using less energy, thus reducing the overall power consumption of the system.

[News ID 3855](#)

Hall-Stand 2-353

Vecow: fanless Embedded system for SuperSpeed USB vision applications

Vecow launches her latest embedded elite for SuperSpeed USB vision applications, SPC-2900 Series Ultra Compact Fanless Embedded System. With all-in-one designs, ultra-integrated functions, compact size, multiple I/O onboard, user-friendly, smart manageability, wide range power input, trusted compatibility powered by Renesas USB technology and rugged reliability in harsh environments to make easy implementation possible, Vecow SPC-2900 Series Ultra Compact Fanless Embedded System is your smart choices for Machine Vision, Automation Optical Inspection (AOI), Vision Inspection, Motion Control, Packing Inspection, Industry 4.0 and any Internet of Thing multiple USB 3.0 Vision applications.

[News ID 3614](#)

Hall-Stand 5-445

Telit: LTE IoT modules expand 4G portfolio in CAT-1 and CAT-4 standards

Telit announced five new LTE IoT modules, one category 4 (CAT-4) and four category 1 (CAT-1), the new IoT focused standard, that includes three North American and one European models. These new LTE products expand the 4G portfolio led by the LE866-SV1, launched as the industry's smallest dual-band, single-mode LTE CAT-1 offering at 15x25mm. Developed for use with North American wireless network carriers, the LE866-SV1, LE910-SV1, LE910-NA1, and the LE910-EU1 for Europe all leverage existing LTE technology aligned with carriers' plans to support the CAT-1 standard in their respective markets.

[News ID 3829](#)

Hall-Stand 2-219

MEN: fast Ethernet interface card for train control

The F305 network controller coming in 3U CompactPCI supports four fast Ethernet channels and real-time Ethernet functionality. Especially developed for rail applications, the card is equipped with robust M12 connectors on the front, is working in an extended temperature range from -40 to +85°C and complies with the EN 50155 railway standard.

[News ID 3838](#)

Hall-Stand 5-213

Pentair: AdvancedTCA ECO modular system with adjustable features

To satisfy the demand for flexibility plus ever-increasing data rates, cooling capacities and power consumption, Pentair has developed the Schroff AdvancedTCA ECO Modular System. Designed with user-friendliness in mind, this 14U AdvancedTCA system offers 14 slots and is based on a modular concept with a cost-optimized scope of features. All features can be upgraded or minimized as required and the cooling and power supply can be easily adapted to suit.

[News ID 3705](#)

Intel® Atom™ Processor E3800 Series AD



WEBS-2190



NANO-6060



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IoT Solutions Alliance

Hall-Stand 1-540

ADLINK: COM Express modules with 6th gen Intel Core

ADLINK announced new COM Express computer-on-modules based on the 6th generation Intel Core i7/i5/i3 processors and latest Xeon processors. These new modules follow the form, fit, function design principal for optimum flexibility in upgrading and application scalability, enabling accelerated development and faster time-to-market for embedded applications.

[News ID 3738](#)

Hall-Stand 1-558

EMTrust: modular box PC with low-power AMD embedded G-series processors

EMTrust, an affiliate of E.E.P.D., is offering a compact, fanless box PC for simple modular expansion with USB modules in industrial applications with its "EM Tough Box Modular TB-M". The TB-M is based on low-power dual and quad-core variants from AMD's embedded G-series SoC processor family with clock rates up to 1.5 GHz. In the smallest spaces, the modular system features a broad range of interfaces with six USB 3.0, four USB 2.0 and three Gigabit Ethernet ports. The TB-M can be augmented with a mounting carrier, which allows a wide range of USB modules to be connected.

[News ID 3727](#)

Hall-Stand 2-311

IEI launches new RISC-based touch panel PC series

IEI released the 12", 15" and 17" IOVU all-in-one terminal series to satisfy the increasing demand for Android panel PC. The IOVU series is powered by Freescale i.MX6 Cortex-A9 quad-core 1.0 GHz processor, and sup-

ports a wide range of operating temperature from -20°C to 60°C, as well as featuring Power over Ethernet technology to provide safety and flexibility in power requirement.

[News ID 3717](#)

Hall-Stand 1-358

congatec extends life cycle of ETX and XTX modules

congatec has extended the life cycle of their AMD processor-based ETX and XTX computer modules. The conga-ELX, conga-ELXeco and conga-XXL modules launched in 2005 and 2007 with AMD Geode LX 800 500 MHz processors, will now be supported at least until the end of 2019, extending the module availability from the usual 7 years to 12 - 14 years. This effectively doubles the standard availability of embedded x86 processor technology.

[News ID 3846](#)

Hall-Stand 1-370

Maxim: universal input reference design provides accuracy and flexibility for industrial sensors

Industrial automation engineers can now achieve highly accurate measurements for their system designs with the MAXREFDES67# analog front end (AFE) universal input Micro PLC reference design from Maxim Integrated Products. As high-resolution systems move to higher bit counts, they become more sensitive to noise, making such systems difficult to build and maintain accuracy. MAXREFDES67# is a unique 24-bit AFE reference design that overcomes this challenge. Capable of accepting four different signals, the MAXREFDES67# universal analog input requires no jumpers and is 100% software configurable.

[News ID 3680](#)

Hall-Stand 4-138

PRQA: application security at the earliest stage of code creation

PRQA introduced their new certified environment platform - allowing security coding standards and advisories to be applied at the point of code creation, in addition to well established functional and compliance checks. In light of recent high profile exploitations regarding application vulnerabilities, this latest release allows analysis of both legacy code streams and new agile developments. Providing multi-language support for C, C++, C# and Java, combined with straightforward integration of our own static analysis tools, users are now able to apply in-house security rules, as well as external coding standards and sets of common weaknesses, such as CERT and CWETM.

[News ID 3819](#)

Hall-Stand 1-370

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[News ID 3680](#)

ATP New NAND Flash Storage for Automotive Solutions

ATP

Industrial Temperature
 >> -40°C to +85°C

Robustness and Reliability
 >> System-in-Package (SiP)
 >> ATP Developed Tester

Extreme Durability
 >> Number of Insertions: 20,000

Data Integrity
 >> ATP AutoRefresh
ATP S.M.A.R.T. / SD Life Monitor
 >> Monitoring Software

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ATP Booth 1-655

Hall-Stand 1-510

Microchip: dual-channel USB-port power controller maximises system reliability

Microchip announces the expansion of its programmable USB-port power controller portfolio with the dual-channel UCS2112. This new USB-port power controller supports two ports, with eight programmable continuous current limits, ranging from 0.53 to 3.0 Amps for each port, to enable faster charging times at higher currents. Features for protecting and increasing overall system uptime also include integrated current monitoring, precision current limiting, charge rationing and dynamic thermal management.

News ID 3649

Hall-Stand 1-418

Concurrent: 3U VPX server board for clustering and storage applications

Concurrent Technologies announces their first processor board based on the Intel Xeon Processor D-1500 family. TR C4x/msd is a 3U VPX board initially featuring the 8-core Intel Xeon Processor D-1548 and up to 32GB of DDR4 ECC DRAM for high performance embedded computing applications. Additional variants will be available based on processors with up to 16-cores in the Q1 2016 timeframe. For storage applications, TR C4x/msd has four SATA600 interfaces for external drives plus two SATA600 connections for on-board solid state disk options.

News ID 3659

Hall-Stand 5-209

EKF: peripheral slot card for CompactPCI Serial with PCI Express eight channel UART

EKF introduces the SU4-SOPRANO, a peripheral slot card for CompactPCI Serial systems, equipped with a PCI Express eight channel UART (Universal Asynchronous Receiver Transmitter). All ports are available through Micro-D front panel connectors, and can be user configured individually for either RS-232 or RS-485 by means of DIP-switches.

News ID 3628

Hall-Stand 5-360

Infineon: Barcelona improves smart mobility system with CIPURSE-based security solutions

The new "T-Mobilitat" electronic fare collection system will further improve urban mobility. Infineon supplies the security chips for the "T-Mobilitat" infrastructure - for both the chip-based tickets, that work contactless, as well as validators based on the advanced security standard CIPURSE. The approximately five million inhabitants of Barcelona and its surroundings will benefit in several ways: The "T-Mobilitat" smart card will provide all-in-one access to the city's transport network including Barcelona's metro system, bus or any other transportation means.

News ID 3632

Hall-Stand 1-578

TQ: Cortex-A9-module with INTEGRITY RTOS support

The TQ Group's TQMa6x based on the i.MX6 processor from Freescale can now be operated together with the INTEGRITY real-time operating system from Green Hills Software. The TQ minimodule and the INTEGRITY RTOS are ideally suited for applications in which a high degree of safety is required. The minimodule TQMa6Q-AA based on the i.Mx6 is now supported by the INTEGRITY RTOS from Green Hills Software which is designed to meet the highest requirements regarding safety and reliability.

News ID 3713

Hall-Stand 5-445

Telit acquires wireless communications assets from Stollmann

Telit has agreed to acquire Bluetooth, Bluetooth Low Energy (BLE) and Near Field Communication (NFC) assets in hardware and software from Stollmann. Stollmann is a global player in the Bluetooth and NFC business, designing, developing and manufacturing cutting-edge, low-power Bluetooth modules and highly sophisticated software solutions for short range wireless communications. Assets in acquisition include among others, Stollmann's Bluetooth and NFC software stacks, ready-to-use modules and other intellectual property in wireless communications.

News ID 3820

Hall-Stand 1-639

Toradex announces Hardware Partner Program

Toradex announce its new initiative: Hardware Partner Program. The intention of this program is to offer Toradex customers an ecosystem of third party hardware that is compatible with its ARM-based System on Modules. Currently, the program includes Carrier Boards, Carrier Board and Display combos, and Panel PCs.

News ID 3858

Hall-Stand 1-521

DFI: Embedded boards with optimized and thin-profile designs

DFI announced four new embedded boards including two Mini-ITX motherboards, one single board computer, and one 2.5" Pico-ITX powered by the latest Intel Pentium/Celeron processor N3000 family. Based on this new low power platform, designed for mid to entry level systems, these boards deliver enhanced graphics capabilities and premium performance averaging just 6 watts TDP. That makes these boards the ideal solution for a whole range of fanless and energy-saving embedded applications such as industrial automation, retail industries, and healthcare.

News ID 3786

Industrial Sensor Node **M2.COM** Open Standard

Enables a Diverse Range of IoT Applications

Highly Integrated

Modular Design
Flexible support for diverse sensor carrier boards

Standardization
M.2 connector

M2.COM is a sensor platform based on a simple modular design that provides a solid, standardized solution for IoT sensor nodes and sensors.

- Certified Wireless Solutions**
Proven M2.COM modules with RF certification
- Sensor Starter Kit**
Comprehensive SDK and tools
- Built-in IoT Agent**
Compact IoT agent for handling cloud communication protocols
- Device Cloud Ready**
Cloud services for device management and data analysis

Low-power WiFi

WISE-1520 M2.COM Module

- ARM Cortex-M4 processor
- RAM 256 KB memory / 1MB serial flash
- Supports 1 UART, 1 I2C, 1 SPI, 2 GPIO, 2 PWM, 2 ADC
- 22 x 30 mm M.2 key E

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Hall-Stand 1-578

TQ product innovations at embedded world 2016

The embedded specialist TQ Systems will be presenting new modules based on ARM, x86 and QorIQ at embedded world 2016. In the ARM area, TQ will be showing two new modules based on energy-saving Cortex A7 technology: The TQMa7x ARM module uses the i.MX7 at up to 1 GHz. This embedded module is distinguished by very low power dissipation compared to computing power and by the peripheral devices available. The second new ARM module, the TQMa6ULx, is in the planning stage and is based on the i.MX6UL, also an ARM Cortex A7 core at 528 MHz. In the x86 module family, there are now three modules, the TQMxE38M, TQMxE38C and TQMx50UC, with extremely compact dimensions for use in embedded PC applications having greatly variable performance demands. The COM Express Type 10 mini module TQMxE38M can be configured with different Intel Atom processors from the E3800 family and up to 8 GB of memory. The TQMxE38C is the economical but powerful entry class of the COM Express Type 6 compact modules from TQ. For very demanding embedded PC applications, there is the pin-compatible TQMx50UC, which comes equipped with the Intel Core i3, i5 and i7 processors and up to 16 GB of memory.

[News ID 3763](#)

Hall-Stand 1-310

AAEON: gateways make IoT in smart buildings happen

IoT technology revolutionizes almost every aspect of our lives. AAEON is set to introduce this technology to traditional buildings, adding intelligence to them to make smart buildings a reality. AAEON's current quartet of IoT gateways, the AIOT-QA, AIOT-QG, AIOT-QM, and AIOT-DRM, leverages on the Intel IoT Gateway reference design which includes technology from McAfee and Alliance member Wind River, and collaborates with HMS Networks AB for expanding connectivity, improving interoperability, and reducing lead time to market.

[News ID 3775](#)

Hall-Stand 2-219

MEN: CompactPCI Serial reaches out into space

During a first informal meeting at Fraunhofer FOKUS in Berlin at the end of August, MEN Mikro Elektronik's Manfred Schmitz has been asked by players in the space industry to coordinate the start of a new workgroup with PICMG. Prominent players like Airbus Defence & Space, Thales Alenia Space, STI Spacotech, amongst others, were present.

[News ID 3634](#)



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	COMPANY	PAGE
Advertisers Index	ADVANTECH	53
	Apacer	51
	ARTILA	40
	ATP	52
	Avalue	43
	COMMELL	49
	DH electronics	44
	Digi-Key	2
	Ecrin Systems	39
	Elma Electronic	33
	Express Logic	56
	Green Hills	5
	Lauterbach	25
	ADLINK	9
	LPKF	29
	MEN	45
	Microchip	7
	PEAK Systems	21
	PLS	13
	Portwell	3/45
RECOM	23	
Review Display Systems	33	
SYS TEC	46	
WIBU-SYSTEMS	36	
WinSystems	17/46	

Hall-Stand 5-158

u-blox: GPS/GLONASS receiver platform for low-power devices

u-blox announces the release of the u-blox 8 GPS/GLONASS receiver platform. It complements the u-blox GNSS platform portfolio by addressing power sensitive usage, whereas the existing u-blox M8 platform continues to serve applications where navigation performance and highest accuracy are paramount.

[News ID 3780](#)

Hall-Stand 1-306

Sierra Wireless launches lowest-power LTE industrial gateway

Sierra Wireless announced the launch of the AirLink Raven RV50 gateway—the LTE successor to the market’s most widely deployed cellular gateway solution for energy and industrial applications, the AirLink Raven X. The AirLink Raven RV50 offers a truly rugged design and the lowest power consumption of any LTE industrial gateway, providing reliable connectivity for the most demanding remote applications, even when solar panels are the only available source of power.

[News ID 3687](#)

Hall-Stand 5-258

Arrow: Intel Quark processors designed for “Internet of Things” applications

Arrow Electronics will distribute the new Intel Quark processors that Intel unveiled at its Internet of Things Insights event in San Francisco. The new Intel Quark microcontroller D1000, Intel Quark microcontroller D2000 and the Intel Quark SE microcontroller announced today are designed to bring low-cost connectivity, integration and compatibility to the next wave of intelligent things.

[News ID 3635](#)

Hall-Stand 1-310

AAEON: new IoT gateway trio for indoor and outdoor use

AAEON has launched the AIOT-QA, AIOT-QG, and AIOT-QM IoT gateways running on the Intel Quark X1000 Series SoCs. AAEON’s trio of IoT-specific gateways are created and built to enable an IoT lifestyle both indoors and outdoors. Along with the low-power consuming chips, the devices are equipped with the Wind River Intelligent Platform, Linux support, McAfee Embedded Control security technology, and Bluetooth/ WiFi/ 3G connectivity to ensure the most flexible and secure option for implementing IoT.

[News ID 3834](#)

Hall-Stand 5-213

Pentair highlights Schroff Interscale C conduction-cooled case at embedded world

Pentair will be presenting innovative new products and solutions in the field of embedded systems at embedded world 2016. The highlight of Pentair’s presentation will be the Schroff Interscale C, a new, compact, and conduction-cooled case. The Flexible Heat Conductors, when assembled into a Schroff Interscale C chassis, make these cases intelligent solutions for small form factor applications. The Schroff AdvancedTCA ECO modular system will take center stage in the field of xTCA products. This 14 U AdvancedTCA system offers 14 slots and is based on a modular concept with a cost-optimized scope of features. All features can be upgraded or minimized as required. Also, the cooling and power supply configurations can be easily adapted to accommodate specific customer applications. Pentair will also unveil various embedded solutions for the

“ruggedized” product sector. These include a customized CPCI PlusIO system, which is installed in a drone for research purposes. With Pentair’s recent acquisition of Pigeon Point Systems, visitors can now for the first time also see monitoring and control products on display at the Pentair booth – trusted solutions for hardware platform management that are safe to operate. In addition, interested visitors can also benefit from an introduction to the TraceParts CAD portal. This portal provides over 4,000 3D data sets of Schroff products in 32 different native CAD data formats ready for download – all free of charge.

[News ID 3827](#)

Hall-Stand 1-478

Kontron: latest hardware-based security technology on a compact form factor

Kontron announces the availability of the Kontron COM Express COMe-cSL6. The Kontron cSL6 is based on the COM Express compact standard form factor and 6th generation Intel Core i7, i5 and i3 processors. With 16 GB DDR4 soldered memory and 32 GB SLC on board SSD, the Kontron COMe-cSL6 can deliver just about any application to any market.

[News ID 3720](#)

Hall-Stand 4-316

dSPACE: data management software with latest server technology

With SYNECT 2.0, dSPACE has recently introduced a new version of its data management software for model-based development and ECU testing. With state-of-the-art server technology and further improved usability, SYNECT now supports developers of embedded systems and software even better in the management of data generated during their development and test processes.

[News ID 3812](#)

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