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Cover Story:

AMD SoC-based congatec boards - accelerating IoT appliance development

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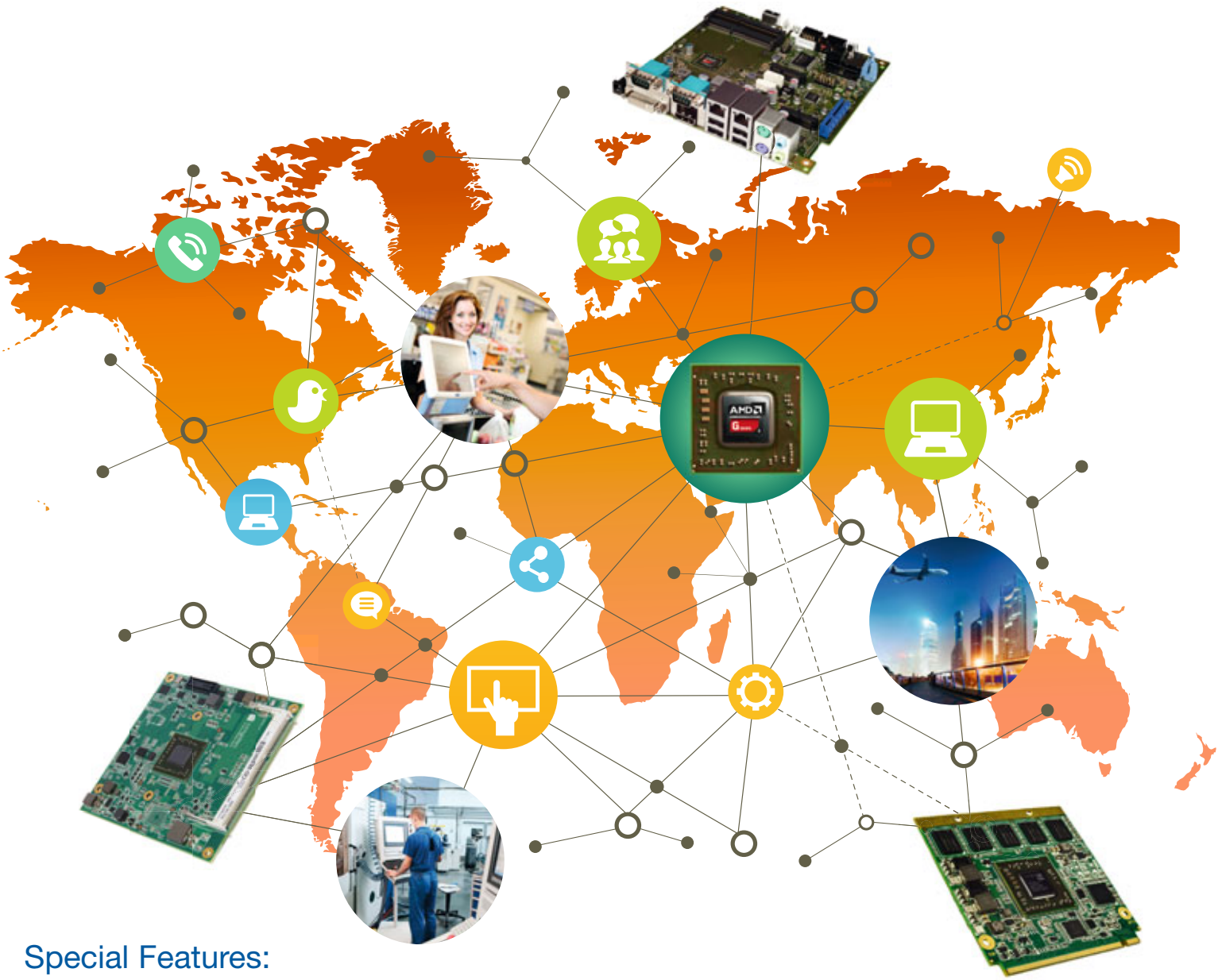


Special Features:

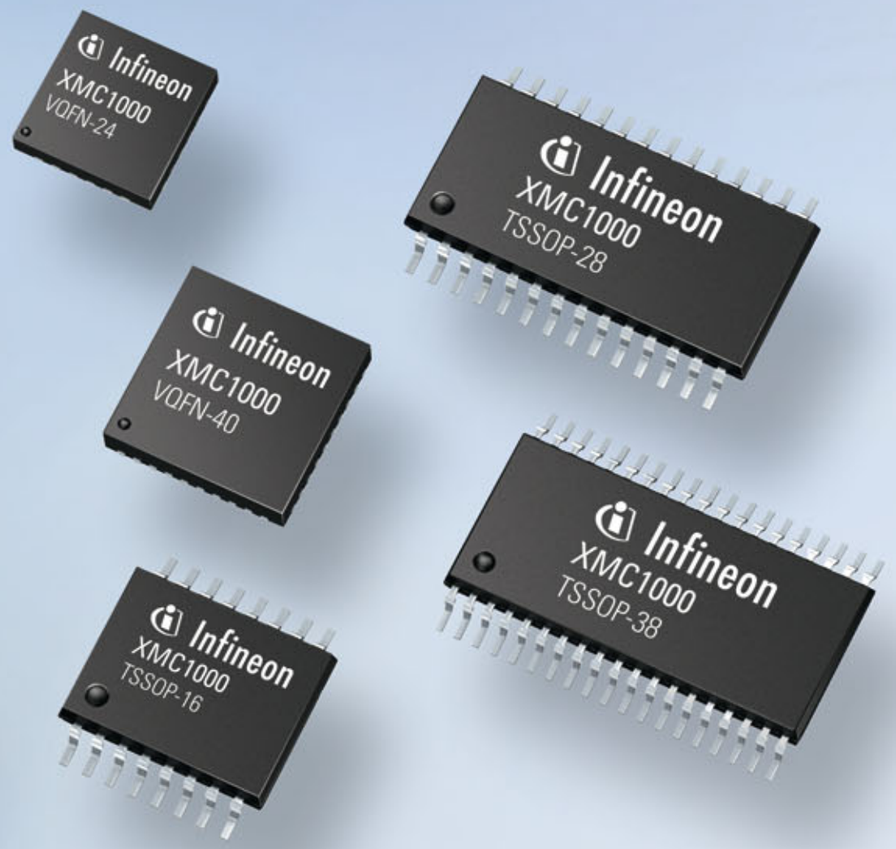
- Internet-of-Things
- Boards & Modules
- Microcontrollers

AMD EMBEDDED SOLUTIONS G SERIES X

congatec the rhythm of embedded computing

Application-optimized microcontrollers supported by dedicated application kits

A microcontroller architecture with target-oriented peripherals for specific applications, a largely automated development environment and practice-oriented evaluation kits are what constitute a modern application-oriented MCU system design.



Standard MCU architectures offer a wide range of different derivatives with regard to CPU performance, memory size, peripheral functions and interfaces. From this offering, users can select the microcontroller that best suits their application. Things would be more efficient if products and/or series within a microcontroller family were already optimized in terms of their functions and the peripheral equipment for specific system requirements. The application-optimized microcontroller family XMC1000 offers both 32-bit performance and functions at 8-bit prices.

One alternative to 8-bit solutions used to date in industrial applications is provided by the 32-bit MCUs of the XMC1000 family. This is because they combine the Cortex-M0 processor from ARM with comprehensive peripheral functions, tools and evaluation kits with high design productivity and are produced using a cost-efficient process technology (65 nm embedded flash production on 300 mm wafers). With recently introduced VQFN packages featuring 24 pins and 40 pins, Infineon provides …

Read more in the article starting on page 10.

Dear Readers,

As already mentioned in the Viewpoint of our March/April print issue of ECE and B&S the next Megatrend in the embedded industry is the Internet of Things (IoT). The race to participate is this new market is on and still accelerating! To succeed in the IoT market companies work closer together and create new cooperation. One example is our cover story which describes the close relationship between AMD and congatec to accelerate the development of IoT applications.

The top vertical growth markets for IoT appliances include first smart factories. IoT will help to increase productivity and reduce inventory costs together with savings in the production and supply chain processes. The second growth market is retail with intelligent POS/POI and digital signage applications because IoT appliances will transform how operators engage with customers, analyze their behaviour, and optimize the impact of their interactions. Healthcare and patient monitoring is another growth market. IoT will enable better-connected devices and data-driven patient management, resulting in improved healthcare effectiveness and efficiency.

A key enabler for all these new decentralized IoT appliances is the right processor technology platform to lend the devices intelligence and connectivity. To achieve lowest R&D costs, the platform should be standardized and should also deliver all the required interfaces in the form of standard building blocks. Furthermore, it is imperative that these standard platforms can be freely programmed. In order to be able to execute smaller as well as more complex tasks it should also be scalable to embrace outstanding computing performance and increased graphics capabilities while at the same time offering high energy and cost efficiency. As time to market will be an increasingly important competitive factor, developers are looking for simplified development. They should, therefore, stick to a technology that offers simple programmability based on common standards as well as a rich ecosystem of peripherals and tool chains.

It is, however, not just a question of the right embedded processor technology. This on its own does not suffice to enable OEMs to expertly innovate IoT appliances. More than anything, they require suitable embedded computing platforms on which to base their applications. To simplify the design, optimize the time to market and keep R&D efforts as low as possible, OEMs should rely on tested and proven standards. This approach is also the best guarantee for maximum design security, reliability and it enables a high level of re-use. The most common and successful platforms for low power SFF devices are Mini-ITX motherboards and the Computer-On-Module standards, Qseven and COM Express for semi custom designs, which are for example offered by congatec.

I m sure this will be only the first cooperation of this kind and many more will follow in future.

Yours sincerely
Wolfgang Patelay
Editor

Cover Photo: congatec/AMD

Cover Story: AMD SoC-based congatec boards - accelerating IoT appliance development Page 6

Gartner foresees that the number of IoT appliances will explode to around 26 billion units in 2020. And all these new installations will require smart embedded SoCs. congatec pre-integrates AMD Embedded G-Series SoCs on a broad spectrum of embedded form factors, helping to accelerate the design of all these new appliances.

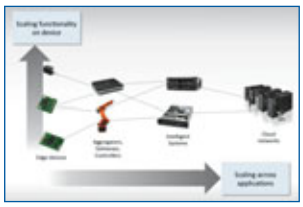
Application-optimized microcontroller series supported by application kits Page 10

The XMC microcontroller family offers 32-bit performance and functions at 8-bit prices. With the XMC1000 architecture, the development environment DAVE, and the DAVE apps coupled with dedicated application kits, an application-oriented solution for rapid and reliable design implementation is available.

Triple redundant single-board computer based on three PowerPC 750 CPUs Page 16

This article introduces triple redundant single-board computers based on three PowerPC 750 CPUs operating in lockstep architecture. Compared to solutions using three individual CPU boards, the one-card approach is much more compact and reduces both software overhead and power consumption.

Safe, secure, scalable RTOS for the Internet of Things Page 22



The modern next-generation RTOS needs to be modular, configurable and expandable to meet the dynamic demands of the IoT among other applications. VxWorks 7 can not only reinforce customer applications in traditional RTOS markets with faster safety or security certification, but can also allow customers to extend their reach into emerging applications enabled by the IoT.

Smart design of IoT applications using Software Platform Builder Page 32

Nowadays billions of people worldwide are connected to the internet with their PCs or mobile devices. One of the upcoming challenges is to extend this computer network to a network of devices which can communicate with human beings, or other devices without human interaction.

AMD SoC-based congatec boards - accelerating IoT appliance development

By Zeljko Loncaric, congatec

Gartner foresees that the number of IoT appliances will explode to around 26 billion units in 2020. And all these new installations will require smart embedded SoCs. congatec pre-integrates AMD Embedded G-Series SoCs on a broad spectrum of embedded form factors, helping to accelerate the design of all these new appliances.

According to leading analysts, the market for IoT appliances will grow to 26 billion installed appliances by 2020. In comparison to 2009, this represents a 30-fold increase and a CAGR of approximately 40 percent. Note that these impressive numbers are on top of all the consumer tablets and smartphones, which are predicted to reach just 7.3 billion by 2020. The result: IoT appliances will be ubiquitous. What, however, makes previously dumb devices IoT ready? They need built-in processor intelligence that is freely programmable and connected. Furthermore, they need to support remote management functionalities as well as autonomous collection, monitoring, and provisioning of data features which help OEMs and operators to increase both the productivity and efficiency of their applications. And these improvements are supposed to result in 1.9 trillion US dollars of additional value-adding sales into diverse vertical markets. Clearly, IoT will be a game changer in many different markets. And there are certain markets that will benefit most heavily from this new technology trend.

The top vertical growth markets for IoT appliances include first smart factories. IoT will help to increase productivity and reduce inventory costs together with savings in the production and supply chain processes. The second growth market is retail with intelligent POS/POI and digital signage applications because IoT appliances will transform how operators engage with customers, analyze their behavior, and optimize the impact of their interactions. Healthcare and patient monitoring is another growth market. IoT will enable better-connected devices and data-driven patient management, resulting in improved healthcare effectiveness and efficiency. Last but not least, professional distributed gaming will enhance gaming and entertainment experience with remote collaboration, rich media, and on-demand programs.

Additionally, with all the data generated and distributed by decentralized IoT appliances, Ethernet powered smart storage devices can enable the corresponding distributed cloud storage infrastructure to achieve highest flexibility in terms of management while improving I/O performance, data recovery time, and cost per gigabyte of cloud storage.

A key enabler for all these new decentralized IoT appliances is the right processor technology platform to lend the devices intelligence and connectivity. To achieve lowest R&D costs, the platform should be standardized and should also deliver all the required interfaces in the form of standard building blocks. Furthermore, it is imperative that these standard platforms can be freely programmed. In order to be able to execute smaller as well as more complex tasks it should also be scalable to embrace outstanding computing performance and increased

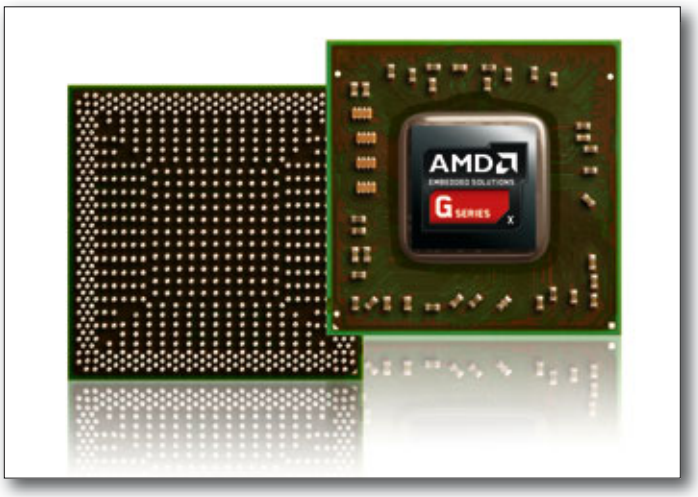


Figure 1. AMD Embedded G-Series SoC

Low power Cost effective High integration SoCs

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- Computer-on-Modules (COM Express, SMARC, Q7)
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graphics capabilities while at the same time offering high energy and cost efficiency. As time to market will be an increasingly important competitive factor, developers are looking for simplified development. They should, therefore, stick to a technology that offers simple programmability based on common standards as well as a rich ecosystem of peripherals and tool chains. This will help developers to reduce development efforts as well as improve the time to market of their new appliances. Additionally, the base technology must fulfill the requirements for small form factor (SFF) designs, combined with high longevity and reliability, to enable the appliances to enter areas which were previously unattainable and to keep the total cost of ownership as low as possible. So it comes as no surprise that many embedded OEMs are opting for low power x86 platforms which are expected to become even more energy-efficient in the future. An increasing number of engineers are currently becoming more attracted to platforms from a vendor who, over the past several years, has been significantly focused on increasing its sales as well as market share in the embedded market: AMD. There are a number of good reasons for this.

Figure 2. Application ready Mini-ITX SBC conga-IGX with AMD G-Series SoC

Figure 3. Slim shaped congatec Qseven module with AMD G-Series SoC

Figure 4. COM Express compact module with AMD G-Series SoC - Type 6 compatible

The AMD Embedded G-Series SoC platform integrates all the aforementioned demands in a single system-on-chip design. The company is leading in the development of a heterogeneous system architecture (HSA) which is also fundamental for IoT applications. Furthermore, it has developed the Embedded G-Series SoCs specifically for power-, graphic-, and cost-sensitive SFF designs. They are available as dual- and quad-core versions and are based on the Jaguar CPU core with 28 nm manufacturing technology and 8000-series AMD Radeon graphics. They can process more instructions per clock cycle, which is also reflected in the execution of various compute-intensive industry standard benchmarks: Compared to the Intel Atom, the AMD G-Series SoCs achieve a 125% improvement in CPU performance when performing industry-standard compute-intensive benchmarks. The ability of the SoC platform to support enterprise-class error-correction code memory (ECC) makes it the perfect choice for applications requiring high levels of data integrity without compromising energy efficiency.

The discrete-class graphics, which are integrated into the AMD Embedded G-Series SoC, enable power applications that previously required a separate graphics processor. These SoCs provide up to 20% more performance when compared to the previous generation AMD G-Series processors and a five-fold improvement over the Intel Atom D525 processor. DirectX 11 and OpenGL are supported on up to two independent displays. Thanks to an improved universal video decoder, new opportunities have opened up for hardware-based video encoding. Furthermore, with the open computing language, OpenCL, computing-intensive tasks can be reassigned to the graphics processor with high parallelism. For such applications, the integrated GPU provides a computing performance of up to 256 GFLOPs. This allows AMD Embedded G-Series SoCs to be used in deeply embedded or so called headless IoT appliances, which are used in environments without a screen, monitor or input device and which do not require a graphics solution.

It is, however, not just a question of the right embedded processor technology. This on its own does not suffice to enable OEMs to expertly innovate IoT appliances. More than anything, they require suitable embedded computing platforms on which to base their applications. To simplify the design, optimize the time to market and keep R&D efforts as low as possible, OEMs should rely on tested and proven standards. This approach is also the best guarantee for maximum design security, reliability and it enables a high level of re-use. The most common and successful platforms for low power SFF devices are Mini-ITX motherboards and the Computer-On-Module standards, Qseven and COM Express for semi-custom designs.

The fastest way for OEMs to integrate the AMD Embedded G-Series SoC into their IoT designs is by deploying Mini-ITX motherboards. They can be obtained off-the-shelf and are ready-to-use, plus, they boast a broad ecosystem of building blocks such as peripherals, chassis and cooling solutions. This makes system development a comfortable, fast and easy task. However, not just any motherboard is suitable for IoT appliances. OEMs should check for high quality boards with long-term availability. An intelligent board design with high EMC (electromagnetic compatibility), long-lasting components, such as poscaps and an extended temperature range, is essential, if OEMs want reliable IoT appliances. With the premiere of its first industrial motherboard, congatec has now also transferred its expertise and quality standards of Computer-On-Modules into the SBC (single board computer) market. OEMs will benefit from the high German engineering quality of the company together with an additional services range of 7+ years availability. Further examples of the added value provided are the global technical support, extended specifications and customized design services, including dedicated BIOS/UEFI features.

For designers who need a higher level of customization, the Computer-On-Module approach serves as the best choice. COMs provide developers with the comfort and safety of a classic board solution combined with the flexibility of custom designs. The module is a standard platform, only the dedicated carrierboard has to be developed. It executes the external interfaces and can be designed in any required form. Due to the separation of the computing and application levels, the design effort is more simplified. OEMs will benefit from high design reliability and improved time to market compared to full custom designs. congatec support and development engineers even advise customers during the planning phase. This helps optimize system and integration costs right from the start. For IoT applications, the company recommends the slim-line Qseven and the COM Express standards.

The new industrial Mini-ITX SBC, conga-IGX, was specifically developed for markets that rely on embedded features but which are cost- and time to market-sensitive. Examples of application scenarios are in the retail POS/POI sector where digital billboards, kiosk and check-out systems or digital scales can get equipped with the conga-IGX. It is also an ideal fit for basic gaming and gambling machines, which benefit from the extensive graphics capabilities of the motherboard for up to two independent displays which makes this type of appliance more attractive and delivers an immersive user experience.

It also targets cost-efficient HMIs in industrial and building automation. Thanks to its high 3D performance in a low power design, this type of system can provide an intuitive, 3D-based GUI with multi-touch functionality. The board offers various extension options via 1x PCIex4 connector and Mini-PCI Express onboard. Flexible system expansion at high data bandwidth can be achieved via Dual GbE LAN, 2x Serial ATA III, 1x mSATA (SATA III), 7x USB 2.0 and 2x USB 3.0. Also it includes typical embedded interfaces such as 8 bit GPIO, 3x serial ports and 1x parallel port. DC power supply with 12V and 19-24V DC input, ACPI 3.0 power management and high-definition audio complete the package.

For extremely slimline SFF designs in demanding environments congatec offers the Qseven module, conga-QG. For power-sensitive applications the company recently launched a version with the AMD GX-210JA SOC with an average consumption of 3W. For extreme environmental conditions, the module is also available for the extended temperature range featuring the AMD GX-209HA 1.0 GHz dual core SoC. ECC (error correction code) memory support makes the module particularly suitable for applications containing safety-critical situations. Application areas are to be found in the industrial as well as the medical sector, where any memory errors can be automatically corrected so as to ensure safe operation. For handheld designs, the company also offers a suitable tablet PC demonstrator. The kit includes a compact carrier board, the AMD G-Series SOC-based Qseven module, a congatec SMART battery board, as well as an intelligent touch screen. Since the demonstrator was designed for practical use, it features a ported operating system and a special mechanical housing.

For PC-like IoT appliances, which demand optimum computing and graphics performance, while also providing the respective special interfaces, a COM Express compact module like the conga-TCG is an ideal solution. It provides VGA, single/dual-channel LVDS with 18/24-bit, as well as DisplayPort 1.2 and DVI/HDMI 1.4a interfaces. This makes it possible to directly control two independent displays supported by the AMD G-Series SoCs. Multistream is also supported by DisplayPort 1.2 in order to control up to two displays per graphics port in daisy-chain mode. This is ideal for all graphics-heavy applications, e.g. for digital signage or gaming. The conga-TCG highlights its versatility with a broad performance range. Currently the company offers a total of four x86 processors with the AMD Embedded G-Series SoC platform.

What's best for your application? Mini-ITX, COM Express or Qseven? The answer will be different from application to application and can best be provided after a discussion about the technical and commercial details. But however the decision will be, one thing is for sure: With Mini-ITX, COM Express and Qseven developers will find the right concept for their requirements. ■

Application-optimized microcontroller series supported by application kits

By Dirk Heinen, Infineon

The XMC microcontroller family offers 32-bit performance and functions at 8-bit prices. With the XMC1000 architecture, the development environment DAVE, and the DAVE apps coupled with dedicated application kits, an application-oriented solution for rapid and reliable design implementation is available.

■ Standard MCU architectures offer a wide range of different derivatives with regard to CPU performance, memory size, peripheral functions and interfaces. From this offering, users can select the microcontroller that best suits their application. Things would be more efficient if products and/or series within a microcontroller family were already optimized in terms of their functions and the peripheral equipment for specific system requirements. The application-optimized microcontroller family XMC1000 offers both 32-bit performance and functions at 8-bit prices.

One alternative to 8-bit solutions used to date in industrial applications is provided by the 32-bit MCUs of the XMC1000 family. This is because they combine the Cortex-M0 processor from ARM with comprehensive peripheral functions, tools, and evaluation kits with high design productivity, and are produced using a cost-efficient process technology (65 nm embedded flash production on 300 mm wafers).

With recently introduced VQFN packages featuring 24 pins and 40 pins, Infineon provides a portfolio for its XMC1000 industrial microcontrollers which currently includes more than 60 products in 5 package types. XMC1000 microcontrollers in the VQFN-24 package are only 4 mm x 4 mm in size. This makes these microcontrollers ideally suited for motor drives as well as sensor and actuator applications that need to have a highly compact design. In addition to the VQFN packages, the MCUs are also available in TSSOPs with 16, 28 and 38 pins.

The three series XMC1100, XMC1200 and XMC1300 differ essentially in terms of their memory capacity and peripheral set. Their flash sizes range between 8KB and 200KB. In addition, these MCUs feature high-performance PWM timers, 12-bit A/D converters and programmable serial communication interfaces. The three product series each support different dedicated application areas. By way of example, the XMC1100 Entry series offers a basic range of functions to facilitate entry into the XMC world. Thanks to the 12-bit A/D converter and 16-bit timers, it is possible to generate diverse PWM patterns. All XMC1200 derivates feature e.g. a module for touch control and LED displays (LEDTS) and a peripheral unit for the dimming and colour control of LEDs (Brightness and Color Control Unit, BCCU). The XMC1300 series has a mathematical coprocessor specifically for motor drive controls.

In addition, the microcontrollers of the XMC1000 family (as well as those of the XMC4000 family) satisfy the requirements of the standard IEC60730 Class B, which is prescribed for the safety of household appliances sold in Europe. For example, XMC MCUs offer hardware error correction (ECC) and corresponding memory tests. A further unique feature is the flash loader with a 128-bit AES accelerator, which allows the software IP to be better protected.

The XMC1200 series is predestined for LED lighting applications. Like the XMC1300 series, it features the BCCU unit. The basic function of the BCCU consists in automatically making dim signals available at the port connections for external LED drivers. The BCCU is, with minimal code input, designed for the automatic control of the dimming and the colours of multi-channel LED lamps. A key feature is the automatic high-frequency brightness modulation (PDM with 12-bit resolution). This generates an individual bit stream for each of the total of nine channels. The high frequency produces a high resolution for the brightness value and/or the colour value used in RGB applications. This in turn permits a flicker-free display, whilst supporting a broad spectrum of different LED drivers and/or high-performance LEDs. The BCCU integrates three so-named dimming engines. These ensure the exponential change of the brightness. The exponential dimming and the linear change of the intensity allow the dimming steps and color changes to appear natural to the human eye.

'The Quintessence' of Internet of Things

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- Elements of the interconnected world:
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- Factories organising themselves:
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Figure 1. The portfolio of the XMC1000 industrial microcontrollers currently includes more than 60 products in different packages.

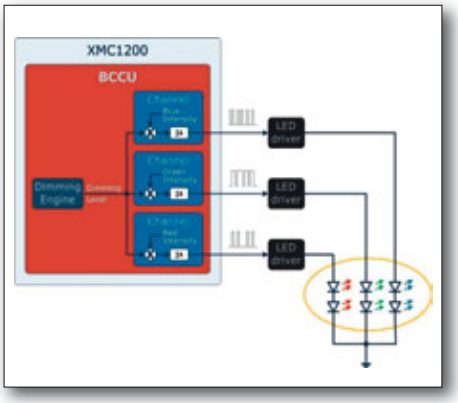

Figure 2. Dimming and colour control of LEDs with the Brightness and Colour Control Unit (BCCU) of XMC1200 microcontrollers.

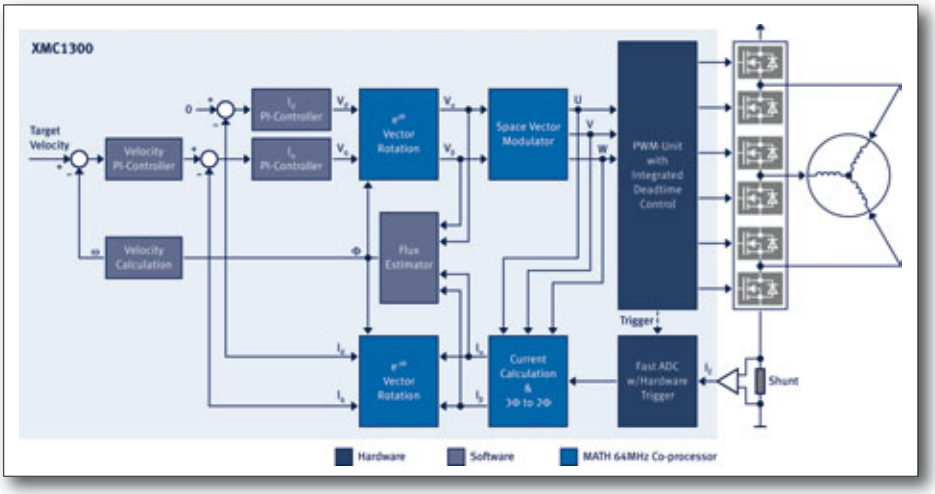

Figure 3. Sensorless, field-oriented control with the XMC1300 microcontrollers

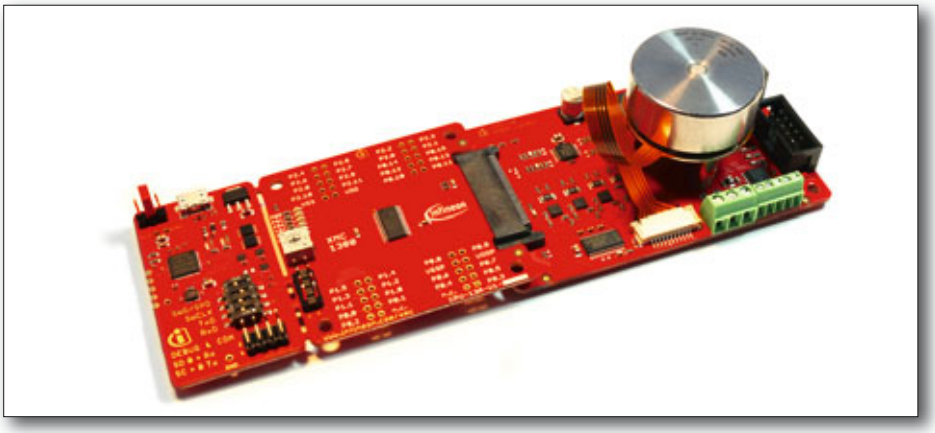

Figure 4. The XMC1000 motor control kit supports various motor schemes

The XMC1300 series is specially optimized for motor drive units. The timer units CCU4/CCU8 and the position interface POSIF can be used to calculate the position and speed of a motor in a simple way. Furthermore, the mathematical coprocessor is capable of performing vector rotation (PARK transformation) with 24-bit resolution, which in turn allows powerful algorithms to be implemented for field-oriented motor control.

The capture/compare unit CCU4 can be used for example for pulse generation or with the aid of the dither function for stabilizing slow control loops. In conjunction with the programmable POSIF block, it is also possible to evaluate an incremental encoder. For various applications, using the POSIF allows the accuracy to be improved and the software simplified, since the corresponding data can be recorded simultaneously. A low-pass filter suppresses the noise and interference pulses from the Hall sensor and/or rotary encoder, which could lead to incorrect position and/or speed readings. With the CCU8 and the additional compare channel, it is also possible to define different time lags for rising and falling edges and to generate asymmetrical PWM signals. Typical applications that benefit from this are 3-phase converters for actuators, 3-level inverters for solar modules and half-bridge transformers. The 64MHz mathematical coprocessor consists of a 32-bit divider and a 24-bit Cordic for trigonometric calculations. Both the divider and the Cordic unit can operate in parallel to the Cortex-M0-CPU. The mathematical unit increases the processing power for real-time tasks significantly.

Common to all modern applications is that the software is becoming increasingly sophisticated. To allow the peripherals to be used efficiently, complex algorithms are often necessary. In other words, an efficient software development environment is required. Ideally, an automatic code generator with predefined and tested software components (apps) is supported. This allows the resources required to be allocated automatically and accurately on the chip.

DAVE is a free, integrated development platform for all XMC microcontrollers. Using DAVE, it is possible to develop an application library quickly, which abstracts all the hardware-related tasks and also offers middleware solutions. The some 170 plus DAVE apps currently available make it possible to combine and configure software components, to map these automatically to the available microcontroller resources and to generate the C code for an application library. The C code generated in this way can then either be further used within DAVE with the integrated GNU compiler and debugger for developing the application, or it can be imported into a third-party tool, such as for example ARM MDK, Atollic TrueStudio, IAR EWARM, Tasking or Rowley.

In addition, Infineon has licensed the "Silicon Vendor Edition" of the ARM Microcontroller Development Kit (MDK). Developers of embedded software can download the ARM MDK free from www2.keil.com/infineon/mdk. The free licence comprises all the tools for the development of XMC1000 applications up to a code size of 128KB. An application library developed with DAVE can be imported with a few simple clicks via CMSIS-PACK interface into the ARM MDK. Dedicated application kits provide the key advantage for users, that the components are coordinated with each other, allowing them to start immediately with their application-specific adaptation. A simple evaluation facility for the XMC1000 products is provided by so-named boot kits, which are available for each

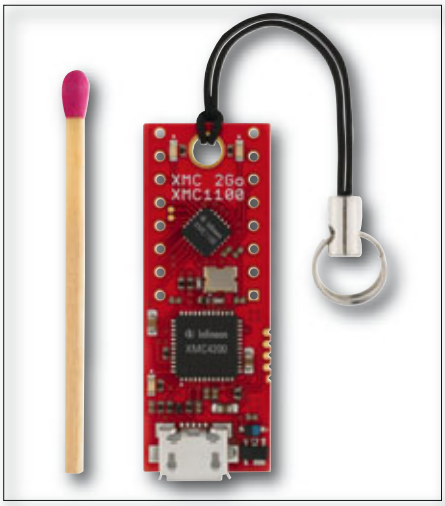

Figure 5. Application-Kit to Go - extremely small kit based on the XMC 1100

of the three product series (XMC 1100 with 64 KB flash; XMC 1200 with 200 KB flash and XMC 1300 with 200 KB flash). The XMC1000 motor control application kit comprises a micro controller board with an XMC1300 and a detachable Segger J-Link debug interface. A corresponding motor board (12 to 24 V, up to 3 A) is also included in the scope of delivery. The board features a 3-phase motor (24 V, 15 W) with a Hall sensor; a rotary encoder interface is optionally available. The kit also includes a power supply (24 V, 1 A). Various motor control schemes are supported: V/f Open Look, block-shaped or sinusoidal commutation with Hall sensors or sensorless, as well as field-oriented control (FOC) with Hall sensors, encoder or sensorless. On the software side, the development environment DAVE as well as apps for various motor controls are available.

LED applications are also supported with a customized kit. The LED lighting application kit comprises an XMC1200 microcontroller with 200 KB flash memory and the Segger J-Link. The scope of delivery includes two LED boards: one colour LED card and one white LED card. The first is equipped with three RGB-LEDs (10 mA), DALI, DMX and RF interfaces in addition to an ambient light sensor. The second board comprises 20 white LEDs in four strings (20 mA), supports DALI and/or RF and, besides the ambient light sensor, also offers a temperature sensor.

The XMC 2Go, equipped with the XMC1100, is maybe the smallest, fully featured microcontroller evaluation kit of the world. The XMC 2Go with the XMC1100 microcontroller is a new budget-priced evaluation board equipped with an ARM Cortex-M0 CPU running on 32 MHz, 64 KB flash and 16 KB RAM. The XMC 2Go has a complete set of on-board devices, including an on-board debugger to immediately start code development. Designers can build their own application and gadget with the XMC 2Go - it fits perfectly fine on a breadboard. The kits includes an on-board J-Link lite debugger (realized with XMC4200 microcontroller), Power over USB (Micro USB) ESD and reverse current protection, 2 x user LED and a Pin Header 2x8 Pins suitable for a breadboard. ■

Product News

■ LDRA: tool suite to verify highly constrained, low-power embedded applications

LDRA has enhanced the ability of the LDRA tool suite to scale down to meet the increasing number of highly constrained, minimal-footprint architectures used in today's safety-critical and security-critical applications. With many systems now being connected, companies must enforce high-quality code, fully test and verify systems, and proactively prevent application vulnerabilities. Achieving indepth analysis on a highly constrained microcontroller is not easy. Verification tools often exceed the bandwidth and memory resources of such microcontrollers, causing the analysis to crash or overload the system such that the target no longer functions as intended and system data becomes unreliable.

News ID 1405

■ Kithara: real-time networking with EtherCAT automation protocol

Kithara Software has announced the successful implementation of the EtherCAT Automation Protocol into its product range, making it possible to set up plant-wide networks in real-time. The EAP, now integrated into Kithara's real-time extension »RealTime Suite«, enables the command level to access and consequently analyze, control and regulate every device connected to the network from a single computer in real-time. This may include, for example, all PC-based controls, machines, testing rigs, conveyor belts, robots, facilities for quality assurance or MES (Manufacturing Execution Systems) for remote maintenance and central plant control.

News ID 1368

Product News

Freescale: 2nd generation Kinetis K series MCUs with ARM Cortex-M4 core

Freescale Semiconductor announce the next generation of Kinetis K series microcontrollers with the expansion of its existing Kinetis K1x, K2x and K6x MCU families, and the introduction of the Kinetis K0x MCU family. In addition, Freescale has expanded its enablement software offerings for the entire product line, providing customers a broad array of MCU software and tools support, including a new Kinetis software development kit and Kinetis Design Studio IDE

News ID 1445

TI: tiny package sizes for several new families of MSP430 microcontrollers

Texas Instruments announced the availability of tiny package sizes to several new families of ultra-low power MSP430 microcontrollers. Developers can now design smaller products with TI's ultra-low power FRAM-based MSP430FR5738 and Flash-based MSP430F51x2 MCUs in wafer-level chip scale packages (WLCSP) as small as 2.0 x 2.2 x 0.3 mm, in addition to the five existing MSP430 MCU families with tiny package options.

News ID 1439

Toshiba: new LEDs for general lighting applications reduce mounting area

Toshiba Electronics Europe has launched a new series of chip scale package white LEDs for lighting applications that can reduce the mounting area by 90% compared to conventional 3.0 x 1.4 mm package products. The new TL1WK series LEDs have been designed as light sources for general lighting, including straight tube lights, light bulbs and ceiling lights.

News ID 1392

Digi-Key: all in one mobile app for Freescale products

Digi-Key has collaborated with Freescale Semiconductor in order to create the electronic component industry's first distributor/supplier collaborative mobile application. In response to the ever-increasing adoption of mobile devices, Digi-Key designed this new app to enhance the user experience for Freescale customers by giving them access to all relevant product information and online ordering resources in an easy-to-use mobile format.

News ID 1459

Maxim: 20-bit, 1.6MSPS successive approximation register analog-to-digital converter

Engineers can achieve high resolution and fastest sampling at the low power with the MAX11905, a 20-bit, 1.6Msps successive approximation register analog-to-digital converter from Maxim Integrated Products. Typically, when engineers require high-precision data conversion, they turn to a delta-sigma ADC. However, to produce high precision and wide dynamic range, those ADCs must consume at least 100mW of power.

News ID 1489

Distec: next generation optical bonding for TFT displays

Distec uses the currently most advanced optical bonding technology VacuBond. High-precision serial production is guaranteed by the automated process and the homogeneous silicone material. Clean room conditions ensure that no dust or dirt particles affect the result. The manufacturing equipment is capable of directly bonding TFT displays in custom bezels and front housings with integrated protective glass.

News ID 1361

Mouser: Intel Quark SoC X1000 processors now in stock

Mouser Electronics is now shipping the new Intel Quark X1000 System on a Chip, the latest Intel 32-bit processor built for the next generation of connected devices. The Quark X1000 is the first in a new line of Intel processors designed for new applications ranging from Internet of Things to wearables, transportation, energy, and industrial control.

News ID 1341

Altera: power conversion solution for high-performance FPGAs

Altera announced a new power conversion solution that makes it easy for board developers to design point-of-load power solutions and achieve a high FPGA performance at low system power. The solution, a monolithic 40A driver plus synchronous MOSFET powertrain, is optimized to meet the core requirements of Stratix V, Arria 10, and Stratix 10 FPGAs and SoCs.

News ID 1438

Microchip expands digitally-enhanced power analogue controller portfolio

Microchip announces an expansion of its Digitally Enhanced Power Analogue controller product line. With the introduction of the MCP19114 and MCP19115 devices, Microchip's diverse range of intelligent DC/DC power-conversion solutions grows to include controllers supporting flyback, boost and SEPIC topologies. These latest devices introduce a step-up PWM-controller and low-side MOSFET driver architecture, with a mid-voltage LDO and fully-functional microcontroller all integrated into a small, high-density power package.

News ID 1508

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XLP 16-bit Development Board (DM240311)

XLP 8-bit Development Board (DM240313)

MICROCHIP

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Triple redundant single-board computer based on three PowerPC 750 CPUs

By Susanne Bornschlegl, MEN

This article introduces triple redundant single-board computers based on three PowerPC 750 CPUs operating in lockstep architecture. Compared to solutions using three individual CPU boards, the one-card approach is much more compact and reduces both software overhead and power consumption.

■ When failure can result in damage to the environment, significant property destruction or even loss of life, the application requires an embedded safety-critical system. In railway applications, no margin of error is tolerable; there is no opportunity to "tweak" improvements on the fly or to allow for unanticipated problems. The three major contributors to unacceptably dangerous outcomes in railway embedded control systems include: component failure; system imbalances; and human error. Fortunately, designers have an arsenal of established standards and guidelines they can use to greatly reduce the odds of a system failure that can result in catastrophic damages. By employing a methodical, verified and documented series of processes that span the full scope of product development and implementation, the chances of having a reliable system with functional safety are much greater.

The railway market is an important area for these types of systems. The world market in the transportation industry is estimated at $200 billion, with an annual growth rate of 2% to 3%. A global initiative driving new opportunities within the rail industry is automated train control (ATC) and operation on-train and wayside. In turn, the key driver for ATC is increased safety for trains and increased comfort for passengers. More specifically, opportunities exist in new technologies for signaling systems and safety-critical sub-segments. These opportunities are evolving in Europe, USA, Australia, China and Russia.

An example of ATC in the US is positive train control (PTC), which is technology that prevents train-to-train collisions. PTC is being driven by the Rail Safety Improvement Act of 2008 (RSIA). The act has mandated widespread installation of PTC systems on freight rail by 2015. A comparable scenario is unfolding in Europe spurred by the European Rail Traffic Management System (ERTMS). The European Union aims to enhance cross-border interoperability and signaling procurement by creating a single European standard for train control and command systems. Transportation safety in other areas of the world is developing as well. China has an initiative similar to that of the US and Europe – the Chinese Train Control System (CTCS). With over 90,000 km of rail in China, this is a huge growth opportunity for suppliers of safety- and mission-critical systems. The infrastructure that needs to be built out for each of these initiatives is immense, and communications cannot be halted, even for a minute, if passenger safety is to be ensured. As these rail systems grow in use as well as in speed, each systems will need to know exactly where each train is, how each is operating, and what state it is in.

A general standard, IEC 61508 by the International Electrotechnical Commission, covers functional safety in electronic systems. It defines the Safety Integrity Levels SIL 1 up to SIL 4. Manufacturers are obliged to find out the necessary SIL for safety-relevant systems or functions by carrying out a hazard and risk analysis. It gives the measure for the effectiveness of a safety function and is expressed by the probability of failure of this function. Different scenarios match a defined scale of numerical values.

Several bodies have added specific standards for the varying industries and applications. For railways, the European Committee for

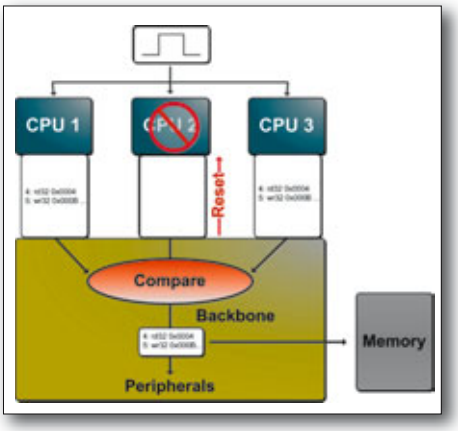


Figure 1. Triple-redundant system: two out of three subsystems must operate correctly.

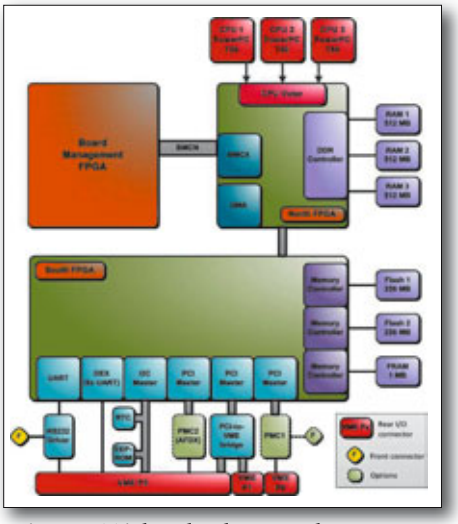


Figure 2. Triple redundancy on the A602 VMEbus computer from MEN

Electrotechnical Standardization (CENELEC) has issued relevant documents. These include EN 50126 (Reliability, Availability, Maintainability and Safety (RAMS) in rail systems), EN 50128 (Software for railway control and protection systems) and EN 50129 (Safety related electronic systems for signaling). EN 50129 also contains the exact definition of SIL levels specially for railway applications. It derives the matching SIL from the Tolerable Hazard Rate (THR) per hour and per function. SIL 4 allows a range of 10-9 to 10-8, down to SIL 1 with 10-6 to 10-5.

A safety-critical application demands a safe system with a determined error behavior. The most logical starting point for incorporating system-level safety is in the initial planning phase. It is during this phase that the all-important step of fault recognition has the highest chance for success. This practice helps to ensure that fault recognition can be incorporated into the basic structure. If a fault is not discovered during the initial phases, the system cannot be prepared to prevent that fault reaction. Through the use of an inductive analysis technique known as Failure Modes and Effects Analysis (FMEA) conducted at the initial planning phase, determination can be made if the system will satisfy the required Mean Time Between Failure (MTBF), the predicted elapsed time between inherent failures of a system during operation.

It is also important to consider which type of behavior a sub-system must have. A fail-operational system is capable of completing an operation or at least phases of the operation, following the failure of one or more components. Since the operation may not be completed as designed, these systems can result in unsafe conditions. In turn, a fail-safe system is designed to mitigate unsafe consequences in the event of failure. When the system fails, the application yields a state that is no more unsafe than when it is operating correctly, at the minimum.

An important strategy used to lessen risk in safety-critical systems is the use of redundant subsystems. Redundancy can reduce risk by increasing the MTBF value, which can be achieved by incorporating multiple executions of the same component in a system. Of the many possible approaches to design redundant features into a system, each carries its own capabilities and limitations. A doubled computer increases availability. If one CPU fails, the system can still be online using the remaining CPU. To increase safety, too, both systems must be operating in order for the application to run. If full system function depends on two systems working correctly, this actually reduces availability. The most common configuration for increasing both safety and availability is a triple-redundant system. Three CPUs or systems are running with a voter that constantly

monitors the output of the three components. If there is a problem with one of the systems, the voter will isolate it and the other two will continue operating.

A minus with this design is the complexity such a system requires. It is imperative that all three CPUs be synchronized and have the capability to communicate with each other; a major challenge from a software development perspective, but one that can be overcome with the proper technical resources to rely on. In some critical applications, availability defines safety, while in railway systems specifically, availability does not necessarily influence safety. Whereas a train can be stopped when the control system fails, for an airplane, this is not an option. A train that is at rest (that is, not available) is in a safe state. It heavily depends on each application which exact behavior is required for a specific function. This even goes for the definition of "safe", as we have seen.

When implementing redundancy you need to consider that identical subsystems can fail simultaneously because they are vulnerable to Common Mode Failures (CMF, failures with a uniform behavior) and Common Cause Failures (CCF, failures that occur by one common cause). You can counter this by building in differences, so that a single fault does not result in the corresponding failure of multiple components and ultimately the system. This principle is called diversity.

For instance, common mode failures, such as an electrostatic discharge, can disturb identical outputs resulting in failure. Another example is a shared power supply or shared memory device that can affect redundant processor outputs. When the shared resource fails, all of the redundant CPUs could be prevented from performing their intended function. A system architecture using two independent CPUs, independent clocks and independent power supplies can still share a common memory as long as it is secured by a check sum or an error correcting code (ECC) function. Using two different physical executions of a binary output, instead of two identical types, can improve reliability. Diversity can also be achieved through the use of varying software. For instance, you can run different, independently designed software applications on the redundant subsystems.

A system with built-in triple redundancy is an innovative architecture that offers an alternative to classic configurations. It contains three processors and three memory ranks running in lockstep mode. All are monitored by a voter contained within a field programmable gate array (FPGA). Should CPU 2 fail, the voter isolates it, puts it into reset mode permanently and indicates this to the software. The voter then switches to "compare" mode in which only the outputs of the remaining two processors are compared. The system is still fully functional; however, a fault in either CPU 1 or CPU 3 would be fatal to the system. Even diversity is possible on one single board: memory management of the PowerPC processors in the MEN design allows partitioning the resources, which is in turn supported by real-time operating systems like PikeOS. The partitions are assigned specific memory areas. The applications and tasks being executed within the partitions can be completely different.

The value of contracting with a supplier experienced in mission-critical applications cannot be overstated. Manufacturers with a history of success in key areas of safety-critical design and implementation will have the most expeditious and cost-effective outcome. Better still that they should have demonstrated experience in related industry standards such as requirement tracing, code-rule checking for software and FPGA development, risk management, component obsolescence management, qualification, or for example IRIS quality management dedicated to the railway industry. Although the number of qualified vendors decreases as the sophistication and critical nature of the application rises, they do exist. The protection of human life and the avoidance of catastrophic events must be paramount in the computing systems used throughout safety-critical applications. Systems must function reliably and communicate effectively – and nowhere is this truer than in the growing railway market. ■

Product News

■ ADLINK: 40G ATCA switch blade for bandwidth-demanding applications

ADLINK announces the availability of its new 40G AdvancedTCA switch blade, the aTCA-3710, featuring a Broadcom BCM56846 10/40 GbE Fabric Interface Switch, Broadcom BCM56334 24-port GbE Base Interface Switch and Freescale QorIQ P2041 quad-core Local Management Processor. The aTCA-3710 provides fourteen 10 GbE SFP+ uplink ports and supports a total of 640 Gb/s bandwidth for use in 14-slot 40G ATCA shelves.

News ID 1498

■ Advantech: industrial-grade Mini-ITX motherboard with 4th gen Intel Core processor

Advantech introduced AIMB-203, a new industrial-grade Mini-ITX motherboard based on the 4th generation Intel Core i7/5/3 with H81 chipset, resulting in lower power consumption and better graphic performance. Designed with a rich variety of I/O functions, AIMB-203 is ideal for a multitude of applications such as ATM/Kiosks, automation, medical equipment, gaming machines etc. With the preloaded remote management software – SUSIAccess, AIMB-203 not only saves development cost but also enhances system management efficiency.

News ID 1393

■ Artesyn: ATCA system management software accelerates integration of complex systems

Artesyn Embedded Technologies announced a new software solution for its ATCA systems, which Artesyn believes could save up to 40 percent of customers' time-to-market. System Services Framework (SSF) is a complete system management suite for Artesyn ATCA systems, allowing users or applications to configure and monitor the hardware and software elements of a single ATCA shelf or across multiple shelves.

News ID 1490

■ MSC: intelligent starter kit for high-end COM express modules

MSC Technologies presents the ready-to-use starter kit MSC C6-SK-8S-T6T2 for the instant operation and evaluation of its MSC C6B-8S COM Express Type 6 module family based on 4th generation Intel Core processors. The starter kit contains a baseboard, a heat sink with fan and two 4GB DDR3L SO-DIMM memory modules. Designers are free to choose any COM Express module from MSC Technologies' MSC C6B-8S product family.

News ID 1411

■ AAEON: mini-ITX industrial boards with 4th Gen Intel Core processors

AAEON announces the release of the three new Mini-ITX industrial boards: EMB-QM87A, EMB-CV2, which are designed to fulfill the growing needs of NVR and industry automation markets, and EMB-Q87A , designed for AIO and digital signage applications. The EMB-QM87A is a Mini-ITX form factor board featuring a 4th generation Intel Core i7/i5 processor and the mobile Intel QM87 Express chipset. It supports two DDR3L 1333/1600 SODIMMs with a maximum of 16GB memory.

News ID 1431

Avalue: 3.5" module based on DMP Vortex86DX2 SoC CPU

Avalue Technology announce the ECM-DX2. The module which is highly integrated, has low power consumption design, fanless operation and extended temperature supported by using the DMP Vortex86DX2 SoC CPU. Vortex86DX2 SoC CPU is indeed designed for industrial and embedded applications due to various integrations of I/Os, compact design, longevity, ruggedness, and power efficiency. The SoC integrates CPU, North and South Bridge, GPU, HD Audio, versatile I/O ports, ISA, and PCIe bus into a single chip.

News ID 1408

Seco: developer kit for NVIDIA's Tegra K1 mobile processor

SECO informs that the NVIDIA Jetson TK1 Developer Kit is now available for pre-order on the shop. At the heart of the Jetson TK1 Developer Kit is the Tegra K1 mobile processor, NVIDIA's 192-core super chip built on the NVIDIA Kepler architecture, the world's most advanced and energy-efficient GPU architecture for mobile and embedded applications. The Tegra K1 mobile processor features an ARM Cortex-A15 32 bit processor which will also be available as a pin-to-pin compatible ARMv8 64 bit based processor with all the graphics performance, parallel computing capabilities and CUDA library support that NVIDIA is famous for.

News ID 1467

Vecow: fanless Box PC series with Atom E3845 for IoT and cloud computing

Vecow announce the ABP-2000A series Fanless Advanced Box PC series. ABP-2000A series are still equipped with Intel Quad-Core Atom E3845 processor family (1M Cache, 1.91GHz) and DDR3L single channel 8GB ram, two HDMI display, two RS-232, two RS-232/422/485, two isolated RS-232/422/485(ABP-2845A only), four GbE LANs, one 2.5" SATA 3Gp/s SSD/HDD tray, three USB 3.0 ports, two USB 2.0, and one miniPCI-express.

News ID 1497

Sealevel: isolated digital input boards support AC and DC voltages

Sealevel Systems announces the addition of two new digital input boards, the 8510 and 8511, to the SeaRAQ family of I/O expansion designed for Relio R3 rackmount industrial computers. Each board provides 16 optically isolated inputs with 1500 VAC isolation to prevent damage from harmful voltage spikes and surges often found in industrial environments. The boards for I/O intensive applications include process control, test and measurement, and data acquisition applications.

News ID 1395

DFI: compact Embedded chassis accommodates any 3.5" SBC

DFI launches ES520 compact embedded chassis that can accommodate any 3.5" SBCs. With dimensions of 166 x 50 x 157.3mm, this compact embedded chassis can easily fit into any space-limited environments. The embedded chassis is design with 1 2.5" SATA drive bay, 4 or 2 optional USB ports at the front panel, as well as 1 system fan to promote cooling efficiency. To ensure better communication, it is also equipped with 2 Wi-Fi module antenna holes making the chassis suitable for a variety of wireless-concern applications.

News ID 1516

VIA: compact ruggedized IoT system with rich network connectivity

VIA Technologies announced the VIA AMOS-3003, a compact embedded IoT system designed around the tiny VIA EPIA-P910 Pico-ITX board. Combining low power, rich connectivity and high performance 64-bit computing in a ruggedized design, the VIA AMOS-3003 delivers all the latest features and digital media standards required in data collection terminals for in-vehicle control as well as machine to machine controllers in a host of industrial automation applications.

News ID 1514

Extended temperature Mini-ITX solutions for traffic surveillance

By EmbCore Marketing, ADVANTECH Europe

This article shows how the Advantech COM Express module SOM-5894 with Mini-ITX Application Board SOM-AB5810 provides a versatile cost-saving solution with flexible upgrade capabilities for traffic control systems.

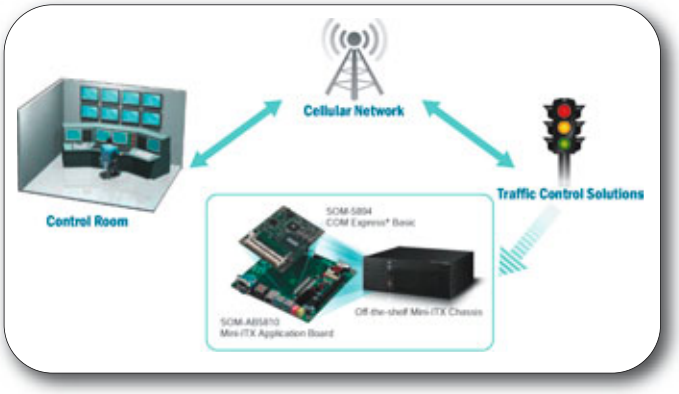


Figure 1. COMe basic board and COMe application board used in traffic control

■ Developing traffic control systems has never been easy. Nowadays, traffic improvement schemes require real-time information to make instant adjustments in signaling, without being limited by mechanical constraints while being fully aware of upstream and downstream traffic conditions. In other words, innovative traffic surveillance solutions at each signal must know the actual traffic conditions, have the power to make dynamic changes and appreciate what conditions will exist in the next few minutes. By adapting to actual traffic demand, the system should be able to estimate traffic usage based on a small historical sampling and to generalize those results for optimal operational performance. Innovative solutions require real-time adjustment in signalization according to actual traffic conditions, and must be adapted to outdoor environments with zero downtime.

SOM-5894 COM Express module with Mini-ITX application board SOM-AB5810 is suitable for deployment in large traffic surveillance systems, providing high-end computing performance along with extended temperature support ranging from -40 to 85°C. This is rare among Mini-ITX form factor systems as this solution can leverage numerous proprietary off-the-shelf Mini-ITX chassis and peripherals to enhance design flexibility and save total solution cost. COM Express form factor also supports scalability and future platform upgrades. Remote device management is extremely important for these kinds of traffic surveillance applications. Both boards employ Advantech SUSIAccess and iManager software, which provide secure remote management functions for system administrators. SUSIAccess, a software-based remote management software utility, provides functionalities like remote monitoring and remote KVM. iManager, a clever self-management tool with soft-som-594ware control functions and separate hardware design, is a solution that lightens development effort and speeds up product time-to-market for system integrators. Excellence is demonstrated not only in outstanding ruggedized hardware design but also in software and firmware support. The Mini-ITX form factor is widely used for embedded applications and offers integration flexibility with many off-the-shelf Mini-ITX chassis/ peripherals. Because it is hard to design Mini-ITX board solutions for projects requiring extreme performance in -40 to 85°C operating temperatures, Advantech released a series of new -40 to 85°C Mini-ITX board solutions to support tough work environments. SOM-5892 is designed with COM Express type 6 and third generation Intel Core i7/i5/i3 processors, and SOM-5894 is designed with the latest fourth generation Intel Core i7/i5/i3 processors. SOM-

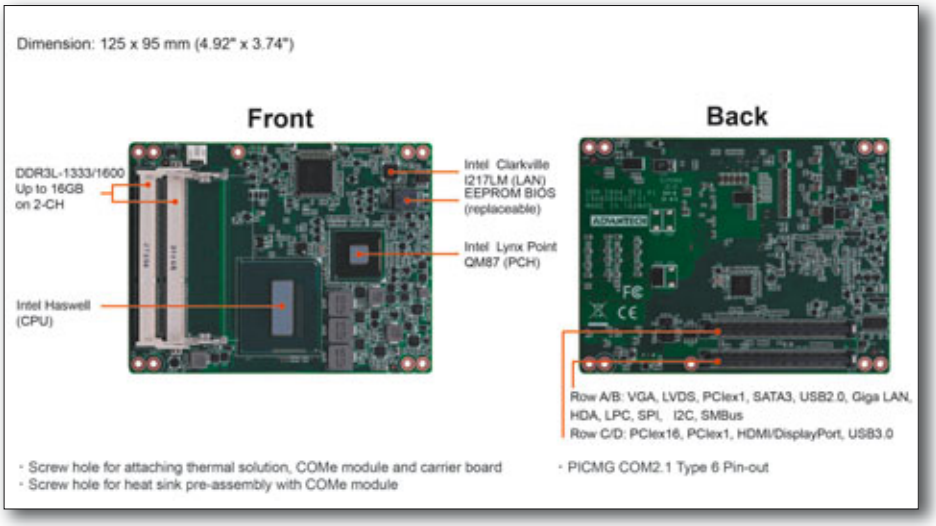


Figure 2. Top and bottom view of SOM-5894 basic board

AB5810 and all Mini-ITX boards can be applied in many fields such as industrial control, traffic control, outdoor signage, vehicle and military embedded applications which need to operate in harsh conditions. The high performance computing platform supports image recognition, -40 to 85°C wide-temperature support, and the rugged system provides high reliability in harsh environments. The SOM-5894 offers high performance and outstanding graphics, supports multiple combinations of three independent displays, as well as abundant high speed I/O and flexible expansion interfaces up to PCIe x16 Gen 3. The board provides a solution for high-end industrial applications such as medical, automation, gaming, telecom, and digital signage. The design of the low power PCH and low voltage DDR3 improves power consumption. The basic board includes both quad core and dual core processors each with different TDP. Customers can also enable lower TDP options through the new configurable TDP down function to meet different needs. Supporting wide voltage operation (8.5 to 20V), and offering high performance makes the board entirely suitable for high-end applications.

Along with the advancement of large high definition panels, multi-display features have become more necessary. New generation Intel HD Graphics with DX11.1, OpenCL 1.2 and OpenGL 4.0 support offers enhanced media effects and significantly improved 3D performance. The board supports three independent symmetrical displays, enabling better display configurations with no bandwidth limitations. Different display combinations include: 3 display ports, or display port+HDMI+HDMI, etc; either in clone mode or extended mode - benefiting the medical, gaming and digital signage industries. Built-in high speed I/O ports include USB 3.0 and SATAIII for huge data transmission. In addition, there is support for expanding the payload with FPGA or ASIC. The PCIe x16 lane up to Gen3 (8 GT/s bit rate) can be used in combinations of x8 or x4, and the 6 CIe x1 lanes can be used in configurations of x4 or x2. Because of its flexibility, customers have the advantage of I/O expansion at the time of system design. iManager, included with the board, provides a valuable suite of programmable APIs such as multi-level watchdog, hardware monitor, smart fan, brightness control and more, all with user-friendly interfaces. It also comes with SUSIAccess bundled for system integrators to remotely centralize monitoring and management of all their embedded devices, and even recovers them if they fail.

Advantech Embedded Core Services offers design-in oriented services. These streamlined solutions broadly integrate embedded boards, peripheral modules and software. This dedicated focus on embedded design-in services fulfills electronic engineering demands at their design-in phase, and brings benefits that shorten the design and integration cycles, minimizing uncertainty and risk. ■

Product News

■ DFI: complete line of 7" panel PCs based on ARM and x86 architectures

DFI's seven IP65-rated Panel PCs based on the low-power and cost-efficient ARM Cortex-A and Intel Atom processors are designed for today's growing performance/wattage requirements of intelligent systems. DFI's new Panel PCs provide a variety of storage options such as eMMC onboard, an SD/MMC slot for extending extra storage and 3G modules. They also come with LAN, COM, USB ports for various demands and up to 12-bit GPIO for device control. With the flexible I/Os providing increased computing and graphics performance, the new Panel PCs allow your system to process more data load and provide faster loading of frequently used applications. The Mini PCIe expansion slot also offers additional capabilities for the various demands.

News ID 1380

Safe, secure, scalable RTOS for the Internet of Things

By Prashant Dubal, Wind River

The modern next-generation RTOS needs to be modular, configurable and expandable to meet the dynamic demands of the IoT among other applications. VxWorks 7 can not only reinforce customer applications in traditional RTOS markets with faster safety or security certification, but can also allow customers to extend their reach into emerging applications enabled by the IoT.

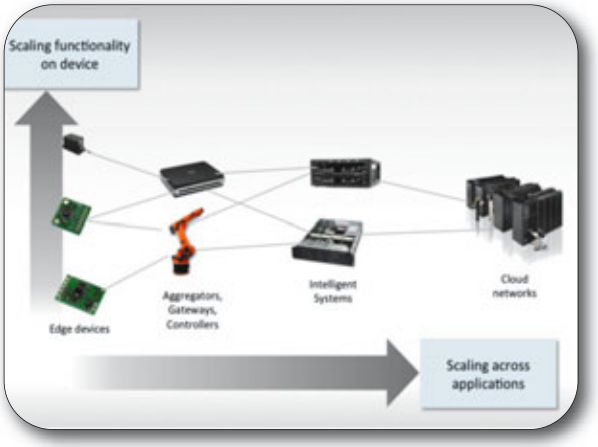


Figure 1. Scaling functionality against applications in IoT platforms

Since its introduction in the late 1980s, Wind River VxWorks real-time operating system (RTOS) has evolved over 25 years to accommodate the dynamics of fast-moving embedded markets. These include the introduction in the 1980s of embedded 32-bit processors bringing the possibility to use dedicated operating systems (OSes) in devices; the move from analog to digital for control devices; the Internet explosion leading to greater connectivity in the 1990s; and the rise of multi-core processors over the past decade or so. And in the last few years the advent of the Internet of Things (IoT) has seen devices become smarter, with distributed control and decision-making ability now a reality.

Many if not the majority of the billions of intelligent devices in the IoT will be embedded systems that run an OS – and many of these devices will employ an RTOS. The confluence of cloud computing, rapidly growing data volumes, and increasingly connected devices in the IoT, poses numerous challenges, but also a myriad of new opportunities. The latest version of Wind River RTOS – VxWorks 7 – addresses this new era for applications that require hard real-time system capabilities.

Devices that were previously standalone and ran an RTOS – such as VxWorks –will now be connected in the IoT and will be transformed from intelligent devices into intelligent and decision-making systems. In this new dynamic customer will need to: bring connected devices to market faster; differentiate products with features and capabilities; address the security risks inherent in IoT connectivity; build flexibility into existing products to address emerging opportunities, as well as ensuring products remain relevant and competitive with market evolution; while also reducing system development costs. To meet these challenges, customers are looking for scalability, security and safety in an RTOS, plus middleware that delivers connectivity, manageability and virtualization capabilities, enabling them to concentrate on their application development.

Traditionally, an RTOS is a monolithic tool and has always been delivered in a bundle of software including the OS, middleware, board support packages (BSPs), and tools. Any updates to this package have been mostly for bug and security fixes rather than the addition of new features due to the prohibitive amount of coding and testing required in implementation. However, the IoT landscape is evolving significantly faster than the release cycles for the traditional RTOS and consequently Wind River has re-architected VxWorks by taking a highly modular and future-proof approach to the design and deployment of its latest version.

Fundamental to VxWorks7 is the separation of the core kernel from packages such as the middleware, networking protocols and applications. Application lifecycles are now completely separate from the core OS enabling individual applications to be updated at any time as required. Multiple versions of packages can also coexist within the development tree, enabling patches or new versions to be tried out and rolled back if and when required. In addition to this, VxWorks 7 also provides the ability to use multiple compilers, enabling high flexibility in the optimization of system performance. Importantly, middleware or new communications protocols and other packages can be added or upgraded via the application store model without changing the core kernel, which is guaranteed by Wind River to stay fundamentally stable for three years. These packages can also include plug-ins for new microprocessor hardware architectures such as those from ARM, Freescale (PPC and QorIQ) or Intel, for example.

The modular architecture of VxWorks 7 will enable embedded device manufacturers to differentiate their products and maintain them competitively over longer periods of time by enriching them with new features and capabilities – and all without having to change the system core – with the evolution of standards and market requirements. In addition, VxWorks

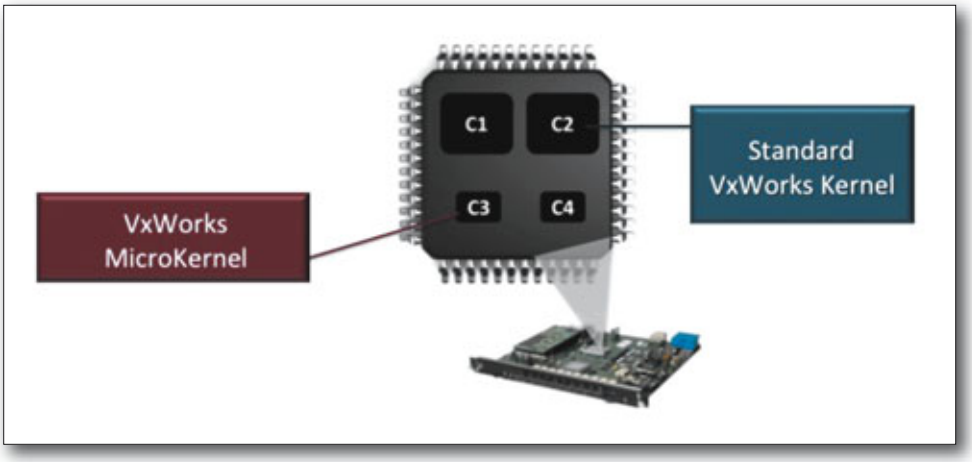


Figure 2. Micro-kernel running on the small core in a big/small multi-core processor

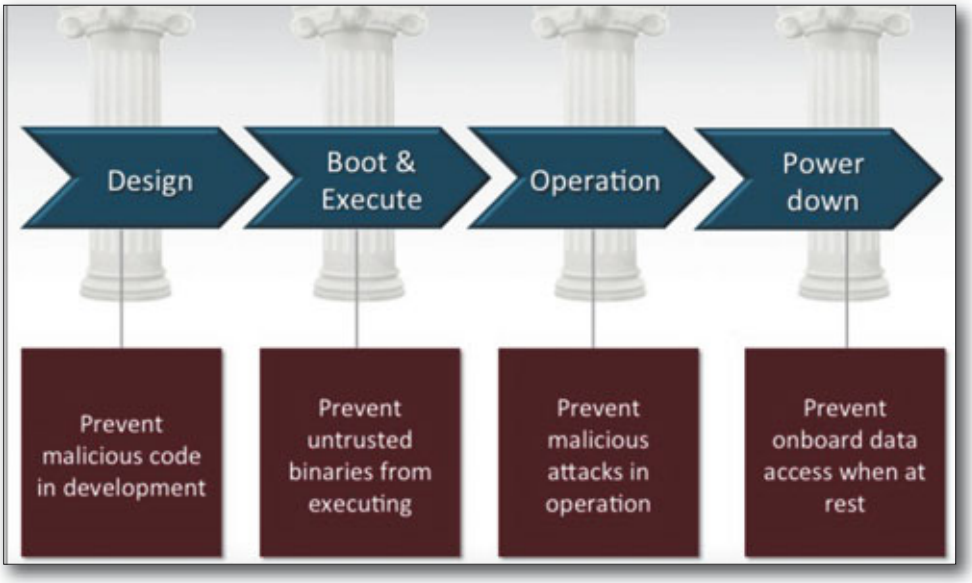


Figure 3. The four pillars of security within VXWorks 7

7 will allow manufacturers to extend the life of the system core across several generations of their products, thereby increasing the return-on-investment (ROI) for the OS.

The modularity of VxWorks 7 delivers a very high level of scalability, allowing customers to choose their required application packages such as connectivity or security-based middleware to suit functionality, code and memory footprint, and performance or power demands of target applications across diverse markets. Customers can now build common platforms across multiple product lines by installing VxWorks in different classes of devices from small-form-factor edge devices, gateways and large-scale complex intelligent systems – all of which will be crucial for the IoT.

In addition, a micro-kernel that is approximately only 20KB in size is also available as a VxWorks 7 Profile. This micro-kernel targets deployment in small or wearable devices, or in larger systems running on a small core in big/small multi-core processor configurations that offload either important or repetitive tasks to the small core.

A critical aspect of the IoT will be security, as its connectivity will mean significantly increased exposure to threats. However, built-in security capabilities within VxWorks 7 will provide designers with the flexibility to design in the necessary or required degree of security. VxWorks 7 has been developed based on four pillars of security, which are: Design for the prevention of malicious code in development; Boot & Execute for the prevention of untrusted binaries from executing; Operation for the prevention of malicious attacks while in operation; and Power-down for the prevention of onboard data access when a system is at rest. Customers can decide upon the right level of security required and if one or all of these criteria are appropriate. This depends not least upon the environment for device deployment – the ability to access devices will not be the same within a defense facility as in a shopping mall, for example. A specific security element is the integrated Root-of-Trust

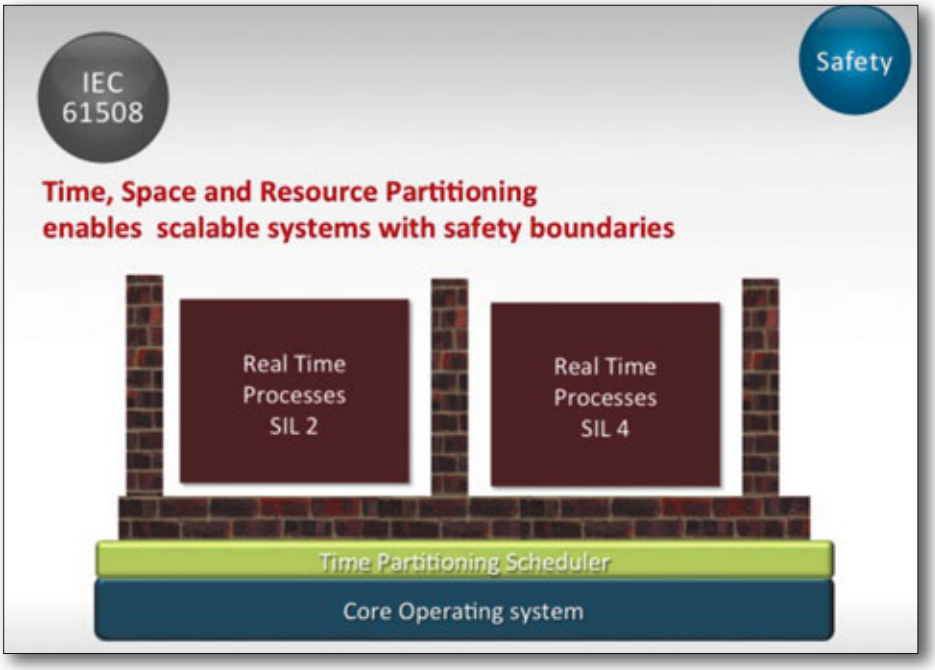


Figure 4. Time, space and resource partitioning

ability within Boot & Execute, which enables digital signature of applications all the way from the boot-loader to the VxWorks image to the applications, meaning only authorized images will be loaded or signature-matching modules will run. Also as part of Operation, customers can apply user management processes based on their authorized user-access policies.

Safety is a prime requirement in many embedded systems, and safety standards are well established in markets such as aerospace, medical and industrial, but are also being applied via new regulations in other markets. As standards evolve, it needs to be easier for customers to obtain mandatory safety and security certifications for end products. VxWorks 7 integrates a time partitioning scheduler as part of the core OS, in conjunction with real-time processors (RTP), to deliver time, space and resource partitioning and enable customers to run different criticality-level applications side-by-side, thereby significantly reducing certification costs in safety-critical applications. For example, makers of medical devices or industrial controllers can go through the IEC 61508 certification process more quickly with the aid of the VxWorks 7 scheduler and RTPs – in essence, every line of code has a cost in the certification world. This new solution essentially bridges the gap between a non-safety RTOS and one such as the VxWorks 653 platform for ARINC 653 certification for avionics applications.

New functionality available in VxWorks 7 includes greater support for development of user interfaces, new connectivity and more storage options. The user interface is becoming

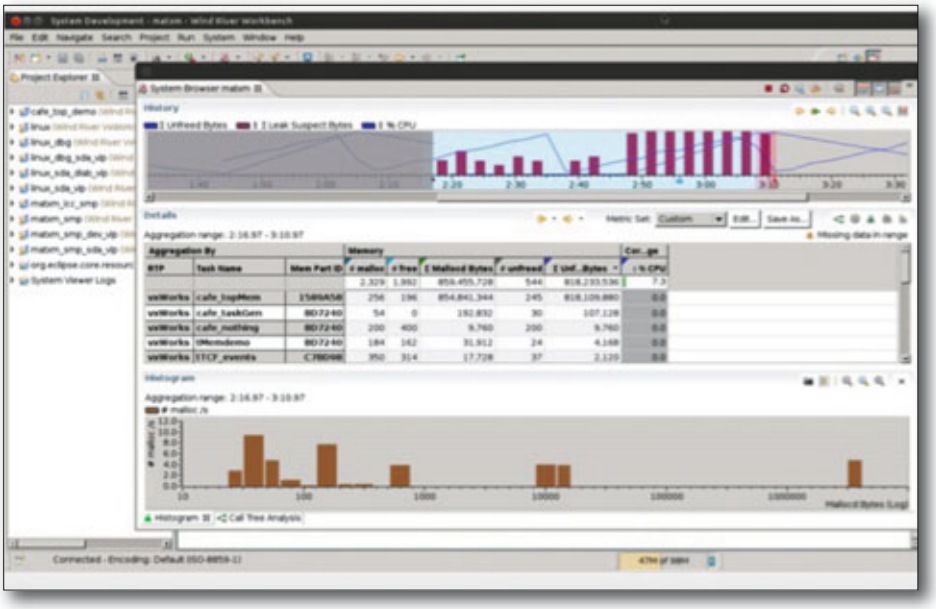


Figure 5. Enhanced analysis capabilities within Wind River Workbench

a key differentiating feature for products ranging from mobile phones to medical devices to industrial control systems: increased support now includes open-source graphics capability such as an OpenVG-based graphics stack, hardware-assisted 3D graphics and frame-buffer drivers for a wide range of processors. Embedded devices are increasingly being connected to networks in a wide range of applications such as industrial control systems or in medical devices used in the home that send diagnostic data back to a hospital. New connectivity protocols within VxWorks 7 include Bluetooth/BLE, CAN, FireWire (IEE1394) and the Continua stack for healthcare applications, along with continued support for ZigBee, WiFi and Ethernet. Also, the tool increased storage functionality includes support for NAND, VFS (Virtual File System) and secure storage of file system data.

Also, and in conjunction with VXWorks 7, the Wind River Workbench tool suite has been enhanced. The tool suite is based on the industry-standard Eclipse (version 4.3.1) IDE (Integrated Development Environment) and the Eclipse CDT (C/C++ Development Tools) plug-ins, and includes tools such as kernel configurators, system and memory analysers and simulators, plus numerous other plug-ins available via Wind River extensive ecosystem of third-party vendors.

Key to the new functionality within Workbench is the ability to dynamically insert code, or even remove it, during system runtime. New system analysis tools also now deliver more advanced data profiling capabilities and processor/memory analysis in various graphical combinations, enabling faster development and reduced costs for customers. ■

Control and connectivity options for the Internet of Things

By Greg Hodgson, Silicon Labs

Well designed, innovative IoT connected devices, apps and cloud services will drive the IoT revolution, in turn requiring IoT end nodes and gateways combining energy efficiency, performance, and cost-effectiveness regardless of MCU bit size. This article examines common architectures to navigate the IoT.

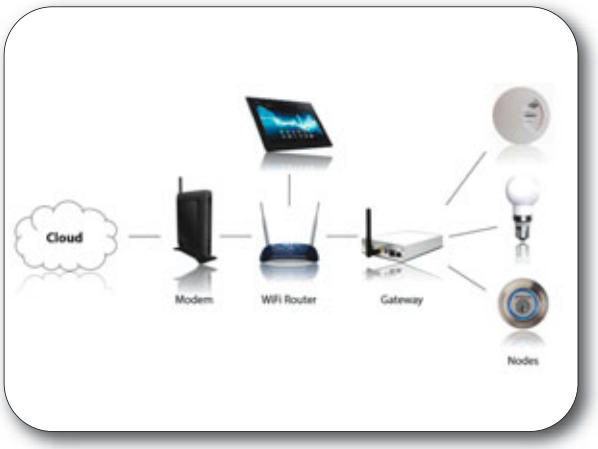


Figure 1. The connected home

We're at the dawn of a new era in connectivity and convenience unlike anything we've experienced before. The Internet of Things (IoT) promises to deliver on the vision of anywhere/anytime knowledge and control of our home and work environments, and depending on which side of Geoffrey Moore's "chasm" you sit, the IoT may already be here. Today I can monitor my connected home and ensure my family is safe, optimize my home energy usage and check on my pets, all while at home or on the road. There will be a tipping point, a handful of innovative consumer products and services that even the late adopters won't be able to ignore, after which there will be little question that the IoT has arrived.

If it hasn't already happened, soon your company management team will propose products to participate in the IoT. How will you respond? The good news is that many of the application building blocks for the IoT are available today, just waiting for you and your team to add your creative genius. We all want to be in control of the security of our home and family, and it only takes a fire or burglary to remind ourselves of this need. A number of upstarts and cable operators have introduced products for the connected home that provide fire, security and convenience services. A typical connected home system architecture comprises a number of sensor nodes ranging from simple to complex, a wireless network featuring a gateway to connect to the Internet wirelessly and potentially provide localized system intelligence, and cloud services to connect to mobile devices. Figure 1 shows such a connected home architecture.

Embedded systems designers must consider a number of competing requirements in designing a gateway or sensor nodes, such as processing speed, memory size, regulatory considerations, energy consumption, system latency, connectivity options, system segmentation, security requirements, interoperability, future migration and system cost, to name a few. The system gateway might be a cable set-top box or a standalone system. See figure 2 for an example of a typical gateway architecture. The gateway microcontroller (MCU) is most likely based on an ARM Cortex-M or Cortex-A class processor combined with connectivity options such as Ethernet, Wi-Fi, ZigBee and sub-GHz/ISM wireless. Considerations for selecting the optimal MCU include memory size and processing requirements for the communications stacks and gateway services, system latency requirements for "real-time" or offline operation, and connectivity. Considerations for selecting the RF subsystem include local regulations (FCC, ETSI, etc), whether connection to a broader ecosystem is desired (which requires a standard) or if the system will be self-contained (a proprietary stack can be used), protocol stack requirements, link budget (which translates into RF range) and system cost. Wireless transceiver energy consumption is relevant to the system architecture since it affects sensor node range and battery lifetime.

A "thin" gateway that only passes sensor and environmental data via Ethernet or an RF subsystem to the cloud could suffice with a smaller, less expensive Cortex-M class MCU, particularly if the communications stack requirements are kept minimal. The advantage of a thin gateway is that intelligence and interoperability between nodes can be managed by cloud services, but the disadvantage is the potential for round trip while waiting for cloud services to process and return command and control data. At the other extreme a "smart" gateway provides the command and control intelligence onboard and has the advantage of minimal latency and full functionality if the cloud connection is lost. However, smart gateway applications must manage the business logic and must be future-proofed to support system upgrades. Nobody wants to buy a wireless lighting control system today that requires a new gateway tomorrow.

The basic connected home node might be a door sensor, wireless light or a smoke detector, as shown in figure 3.The MCU is likely to be a

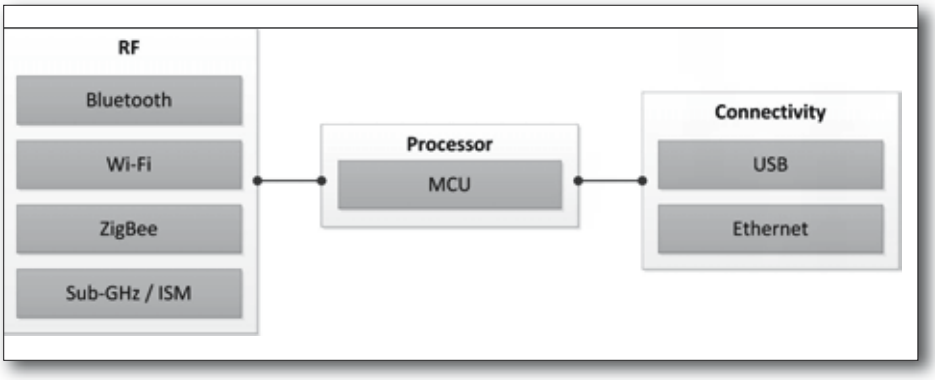


Figure 2. Example of connected home gateway architecture

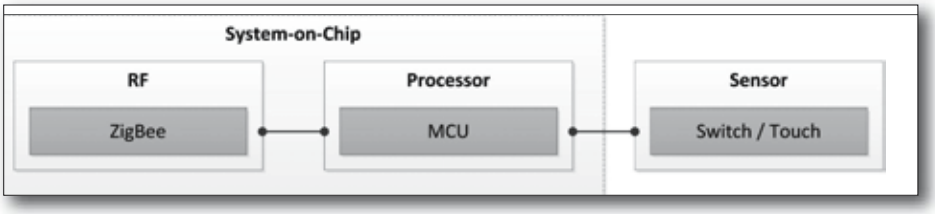


Figure 3. Basic sensor node architecture

low-energy 8-bit device or a 32-bit ARM Cortex-M class device. Considerations for selecting the optimal MCU include memory and processing requirements for the RF stack and sensor management, energy consumption, device footprint and cost. Considerations for selecting the RF protocol include energy consumption, link budget and cost. Typical wireless connectivity options include a proprietary sub-GHz/ISM stack, ZigBee, Bluetooth or Wi-Fi. Of these options, sub-GHz and ZigBee are the most commonly used protocols for home automation as they provide the energy efficiency, long battery life (typically 3-5 years) and extended range required to locate a sensor node anywhere in a house without the inconvenience of having to change batteries frequently. Bluetooth lacks adequate range for many wireless sensor node applications because it there is no provision for repeaters. The power requirements of Bluetooth are also significantly greater than ZigBee. Wi-Fi requires higher power consumption than ZigBee and sub-GHz and is thus not appropriate for battery-powered applications in which the battery cannot be easily recharged.

For sub-GHz star endpoints or flooding-capable RF stacks and space-constrained applications such as sensor nodes, a small footprint, ultra-low energy 8-bit MCU and RF transceiver, or SoC with integrated MCU and transceiver may offer the most cost-effective solution. For ZigBee mesh networking applications, an SoC with integrated MCU and RF subsystems might be the best option, particularly where PCB area is at a premium. Look for MCU and RF transceiver suppliers who offer low-energy 8-bit and 32-bit Cortex-M MCUs and wireless SoCs along with the development tools to simplify implementing the RF stack requirements.

The advanced IoT end node might be a smart thermostat, wireless camera or a white goods device such as a washing machine, as shown in figure 4. The main system MCU is likely to be a 32-bit ARM Cortex-M or Cortex-A class device combined with one or more secondary 32-bit Cortex-M class or 8-bit MCUs used to offload the primary processor, provide features such as capacitive touch sensing, or optimize the energy efficiency of the system by consolidating sensor functions. Key considerations for selecting the primary MCU include memory and processing requirements for the RF stacks, sensor and system management, and cost. Energy consumption will be of concern for battery-powered-solutions. Considerations for selecting the secondary MCU include integrated features and energy efficiency. Look for MCU suppliers that offer the most energy-friendly 8-bit and 32-bit MCUs. Considerations for selecting the optimal RF connectivity solution include bandwidth, energy consumption link budget and cost, with ZigBee, Bluetooth and Wi-Fi being the most common options. Wi-Fi is the most widely used protocol for bandwidth-intensive applications such as a wireless camera, while ZigBee is ideal for thermostat applications with multiple nodes and lower data rates. Wi-Fi or Bluetooth provide easy connectivity with smart phones and tablets, which end users typically use to control their connected home applications.

IoT developers must consider this question when optimizing the energy efficiency of their end node application: "Which is more impor-

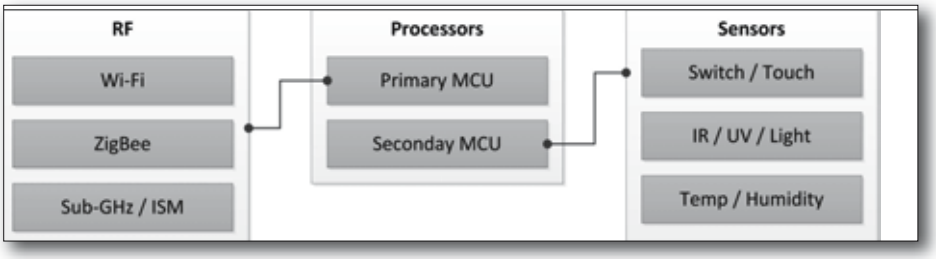


Figure 4. Advanced sensor node architecture

tant for my low-energy application - suspend current or active current?" The answer depends on the active time duty cycle. Some energy-friendly ARM Cortex-M class MCUs can consume as little as 110 µA/MHz in active mode and 900nA in deep sleep with brown-out detection active, which means suspend and active operation contribute equally at 0.1% duty cycle at 8 MHz operation. Navigating MCU vendor datasheets to compare performance for low-energy applications can be a challenge. Look for MCU suppliers that offer energy estimation and profiling tools and offer excellent suspend and active current performance.

Another frequently asked question concerns the choice of MCU bit size for IoT applications: "When should I consider using an 8-bit MCU instead of a 32-bit solution for my end node application? Why not migrate to a modern 32-bit MCU based on an ARM Cortex-M architecture that supports expanded memory requirements, native 32-bit math and advanced peripherals?" For many performance-intensive IoT applications, the 32-bit choice is of course the right answer, particularly where portability and future platform reuse are key concerns. However, for end-node applications where the goal is to fit in the absolute smallest footprint, run a lightweight RF stack, or offload computation tasks from the main MCU, a streamlined and highly optimized 8-bit solution is often the right answer.

A common misconception of an 8-bit architecture is that it suffers in from low code density. In reality, this is true only when attempting 16- or 32-bit math. Control applications such as those found in offloading the main processor do not suffer from low density, and in fact, because 8-bit MCUs have very little overhead code, overall code density for control-type functions is higher than equivalent functions implemented on 32-bit MCUs.

Another common misconception is that 32-bit MCU pricing is comparable to 8-bit options. Developers will hear this from MCU suppliers that are no longer investing in an 8-bit portfolio or competitive in the 8-bit market. The reality is that the 32-bit architecture and peripherals are significantly larger in gate count than 8-bit architectures and consume more silicon area when compared to 8-bit solutions in the same process geometry. Moving to a smaller process geometry shrinks the digital portion (which is about half of a typical MCU) and increases the system cost. When considering a comprehensive IoT solution provider, look for MCU vendors that are actively investing in both 8-bit and 32-bit MCU portfolios, and you will find the most flexible MCU options, the best technical solutions and the best pricing.

The IoT is the vision of a road to a hyper-connected world in which end users have dramatically expanded knowledge and control of their environments – at home, at work and on the road wherever they may be. Elegantly designed and innovative IoT connected devices, apps and cloud services will be most successful in driving the IoT revolution. IoT end nodes and gateways that offer the best combination of energy efficiency, performance, cost-effectiveness and appealing features– regardless of MCU bit size – will be in the driver's seat in the race to our IoT future. Are you ready? ■

Product News

■ Rutronik offers M2M SIM cards and chips from Telit m2mAIR

As of now, customers can acquire Telit m2mAIR M2M SIM cards and chips through Rutronik Elektronische Bauelemente. With extensive roaming options even within the host country, SIM management, security features as well as technical support and a troubleshooting service, these SIMs provide a complete, secure and cost-effective solution for all types of M2M applications while maintaining absolute control over costs. In addition to the standard SIM cards, models with larger temperature ranges as well as soldered SIM chips are also available through Rutronik.

News ID 1375

■ Applied Informatics: software building blocks for the IoT

Making an embedded system ready for the Internet of Things is a challenging task. Complex requirements related to connectivity, interoperability and especially security must be met. A good way to deal with complexity is to rely on existing, industry-proven building blocks. Applied Informatics has developed the IoT Framework, a comprehensive, integrated set of software building blocks for the development of applications targeting IoT gateway devices.

News ID 1513

■ Avnet Memec: IoT at the centre of growth strategies

Avnet Memecis placing the Internet of Things, at the centre of its growth strategies. Internet of Things - often identified by the term Machine-To-Machine - is an ecosystem of remote applications and services based on sensors, actuators and controls connected to an IP network. There are huge market opportunities: estimates suggest that by 2020, 39% of the 23 billion web-connected devices will be IoT solutions, way higher than mobile phones and portable devices.

News ID 1519

■ RUTRONIK: IoT gateway solutions from Advantech and Intel

Advantech releases a new, comprehensive IoT solution: the UTX-3115 fanless and wide-temp embedded box coupled with the Intel Gateway Solutions for the Internet of Things. It simplifies customer deployment of IoT products and allows secure data aggregation, filtering and analysis from edge devices to the cloud through WiFi and/or 4G technologies. The out-of-the-box solution with a pre-integrated software and hardware platform containing a Linux operating system, security and management features, is available at distributor Rutronik as of now.

News ID 1523

■ Conrad supports open source IoT starter kit 'WunderBar'

Conrad is working exclusively with Berlin based start-up company relayr (iThings4U GmbH) to support the development and launch of the Open Source IoT starter kit 'WunderBar'. The WunderBar IoT starter kit together with the relayr Open Sensor Cloud platform allows software application developers to quickly and easily begin working on wireless applications and prototype building based on data gathered from the physical world without needing to learn about hardware. The platform includes software development kits for iOS, Android and Node.js.

News ID 1496

Connecting legacy devices to the Internet of Things

By Adam Burns, Intel

This article highlights the tremendous opportunities created by the explosive growth predicted for IoT applications, and the challenge of existing and legacy devices that needs to be overcome.

Intel uses gateways to the cloud to improve yield in its Assembly/Test factories.

■ The Internet of Things (IoT) refers to billions of Internet-connected devices, ranging from industrial sensors to complex CT scanners. Moving from a world of isolated systems to one where systems communicate with each other and the cloud and back allows companies to make more efficient and productive use of their assets and business processes. In turn, their customers benefit from the added functionality and value derived from the rollout of new business models and service offerings. McKinsey Global Institute recently reported the number of connected machines has grown by 300 percent over the past five years, due largely to IoT technologies driving greater efficiency in the estimated $36 trillion spend in operating costs in affected industries. (McKinsey Global Institute, Disruptive technologies: Advances that will transform life, business, and the global economy, May 2013)

For example, industrial engineers are installing Internet-linked sensors across the factory floor to synchronize production, link machines to smart electricity grids to reduce energy costs, and monitor manufacturing processes remotely via smart phones (Source: Milwaukee-Wisconsin Journal Sentinel, "Rockwell Leading Way in Next Industrial Revolution," Jan 4, 2014). In a store, weather forecasts indicating an approaching storm could trigger a retailer digital signage to play advertisements for weather-related items, like umbrellas and tissues, thus increasing sales. The true value in the Internet of Things is realized when most devices, both old and new, are connected to the cloud and their data is collectively analyzed, revealing actionable insights that can transform business. However, a significant challenge is that many legacy and existing devices, which make up 85 percent of all devices (Source: IMS Research), are isolated and unconnected. New solutions are needed to get them securely connected since waiting for a full refresh of infrastructure to reap the benefits of IoT is impractical. Many legacy devices, especially those used in commercial and industrial applications, tend to have long life-spans. As a result, it is not always possible or economically feasible to upgrade a large number of embedded devices to enable them to communicate with the cloud.

An alternative is to use gateways, which provide value by attaching to existing devices and their sensors in order to secure, aggregate, and filter their data. This creates opportunities to optimize the efficiency of the device, prevent failures, and create new services. The gateway needs to be intelligent and have sufficient processing power to enable end-to-end analytics that will drive business transformation, as shown in the following examples. Intel fabricates semiconductor chips, which are placed into plastic packages and tested in facilities called Assembly/Test factories. Intelligent gateways are being evaluated to connect manufacturing tools to a private industrial, data center cloud, giving Intel meaningful data, including equipment errors, assists, and downtime in real time. The ability to monitor Assembly/ Test equipment a very granular level drives a two times improvement in mean time between failures (MTBF), thus increasing manufacturing throughput.

The worldwide largest heating, ventilation, and air conditioning (HVAC) manufacturer, Daikin Applied, is making use of the Internet of Things through the integration of an Intel processor based intelligent gateway solution in its existing Rebel rooftop units. With the gateway, Daikin Applied is able to seamlessly connect Rebel units to the cloud. As a result, customers can proactively manage the performance of their buildings and address HVAC issues before they happen, thus avoiding expensive repairs and unpleasant temperature excursions.

Intel Labs worked with Daikin Applied to disaggregate component data so now it is possible to see how much energy fans and compressors are consuming, and take corrective action if needed. Daikin Applied estimates that adding intelligence to HVAC systems can reduce energy consumption within a building by as much as 50 percent.

For device manufacturers developing intelligent gateways, Intel is bringing to market solutions based on the Intel Atom processor E3800 product family and the Intel Quark SoC X1000. The processors are supported by software components, including McAfee Embedded Control and the Wind River Intelligent Device Platform, needed to connect, manage, and secure gateways. These designs will help device designers develop, prototype, and deploy application services faster so they can focus on creating new, value-added services. With these solutions, users can securely aggregate, filter, and share data from edge devices to the cloud in areas such as energy, industrial, and transportation infrastructure. ■

The fundamental components of the Internet of Things

By Mark Zack, Digi-Key

As the Internet of Things scales up, more integrated solutions will arrive on the market. But already there are many choices available to the engineer whereby the three key components of IoT support can be incorporated, namely intelligence, sensing, and wireless communications. This article reviews some of the options.

The focus of the internet is set to change over the next five years as systems become smarter. According to networking specialist Cisco, 50 billion devices are likely to be connected to the internet by 2020, helping to sustain a $14 trillion market. The systems that dominate the internet today, such as PCs, laptops, tablets and smartphones, will be dwarfed by the tens of billions of machines with network connections that will relay data to each other with the aim of making life more efficient.

The idea of the Internet of Things (IoT) dates back to the late 1990s when researchers proposed ideas such as ambient intelligence, in which a forest of smart sensors would monitor environmental conditions, alerting control systems to changes. By enacting changes in response, these control systems can improve efficiency in a wide range of systems, from industrial control through home automation to healthcare. For example, a set of smart sensors dotted around the body, can pick up on health problems that alert the user to a problem through their phone. In industrial control, a series of sensors mounted along a production line can detect conditions that may lead to problems such as sudden changes in temperature or excess vibration that may signal a problem in a machine tool or a process going outside its bounds. There are three fundamental components that combine to form an IoT node: intelligence, sensing, and wireless communications. Wireless connectivity is vital because it will allow sensor nodes to be deployed quickly and easily without the requirement to route network cables to each location. In order to survive for long periods of time on a single battery charge, an IoT node needs to exhibit low power consumption. Typically, the node will be dormant for long periods of time, waking up for short periods to take a reading and then making a decision whether to send out an alert based on the change or go back to sleep. A large number of microcontrollers are designed around this core requirement, sporting ultra low energy sleep modes combined with high-performance instruction pipelines to streamline processing while awake.

A key decision is the type of architecture. A growing number of low-cost microcontrollers from vendors such as Atmel, Freescale, STMicroelectronics and Texas Instruments use 32-bit cores based on architectures such as ARM to deliver high performance at low power and access to a growing range of open-source software that allows applications to be built quickly. However, architectures such as Atmel AVR demonstrate that the 8-bit platform still provides a great deal of power, using advanced smart peripherals to collect data from sensor interfaces, and delivering high cost-effectiveness. There are a number of possible approaches for introducing low-power communications to an IoT node, ranging from purpose-designed protocols such as ZigBee to low-power variants of Bluetooth and Wi-Fi. Some of these protocols offer direct compatibility with the internet protocol (IP). Others rely on a gateway to map between IP packets and the leaner protocols used by the IoT sensor nodes. ZigBee is a low-power wireless network specification based on the IEEE 802.15.4 (2003) standard that was developed by a group of 16 companies involved in industrial and building automation. A novel aspect of ZigBee compared to many other networking protocols lies in its use of mesh networking. This allows IoT nodes far away from a central controller to use nodes in between to carry their communications. This not only extends the range of a central gateway, it also increases robustness as a transmission can use a number of different routes through the mesh.

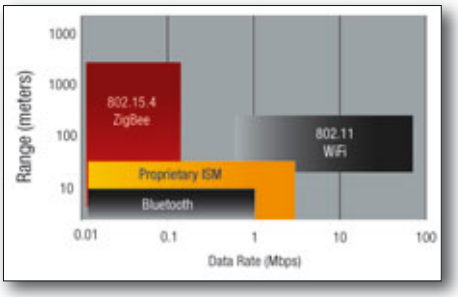


Figure 1. Comparing data rates of RF systems

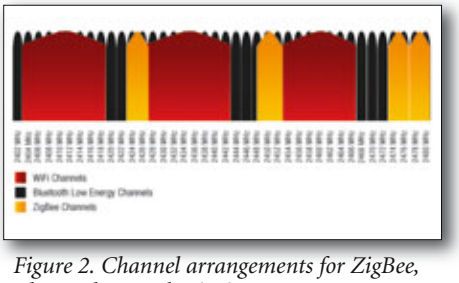


Figure 2. Channel arrangements for ZigBee, BluetoothLE and Wi-Fi

Originally launched by Nokia as Wibree in 2006, Bluetooth Low-Energy (BLE) or Bluetooth Smart provides a similar range to classic Bluetooth but with reduced power consumption. In place of the 1MHz channels used by the original Bluetooth protocol, BLE uses a smaller set of wider-bandwidth channels of 2MHz but with a lower peak data rate. The channel bandwidth is similar to that of ZigBee but with narrower spacing. A key advantage of BLE is its lower latency, just 3ms versus the 100ms of classic Bluetooth, as well as lower complexity, so that its software stack can easily be incorporated into lower-cost microcontrollers. BLE retains support for frequency hopping from the original Bluetooth protocol, which makes it more robust than ZigBee in the presence of strong interfering signals. One of the main application areas for BLE is medical instrumentation, where a number of on-body sensors to monitor heart rate, blood pressure, and posture relay their readings at regular intervals to a central controller, which may be a mobile phone or a dedicated medical instrument.

Having been in use in various forms for more than 15 years, Wi-Fi has the benefit of being the most mature wireless-networking radio technology suitable for IoT applications. Through protocols such as WPS, Wi-Fi can offer easy integration into an existing network for devices that have little to no physical user interface. Of the wireless technologies suitable for IoT applications, Wi-Fi has the best power-per-bit transmission efficiency. Conventional Wi-Fi designs tend to use more energy to maintain a connection while quiescent than protocols such as BLE, which can decrease energy efficiency if the application does not need high bandwidth. However, vendors such as GainSpan have worked on power efficiency in designs such as the GS2000, which combines support for both ZigBee and Wi-Fi on the 2.4GHz and 5GHz band. These designs put the radio into an energy-saving standby mode if the sensor node does not need to transmit any data. It wakes up only to send data or keep alive connection packets used to assure central controllers that the node has not failed.

In general, Wi-Fi tends to suit applications where compliance with the IP stack is an advantage, there is a requirement to deliver large amounts of data, such as audio or video, or the remote devices can be powered by external energy sources. An example of Wi-Fi in use is by Mernok Elektronik of South Africa, which used modules from connectBlue to incorporate wireless networking into the locomotive control and safety management systems of railway systems used in mining. The modules are used to collect real-time operation data on each vehicle and provide a robust wireless connection across both 2.4GHz and 5GHz frequency bands with support for over-the-air firmware updates and parameter changes.

BLE and Wi-Fi can be used together efficiently as they both support coexistence protocols designed to reduce interference between the two on their common frequency band of 2.4GHz. This coexistence ability lends itself to implementation in gateway designs where BLE is used for connections to sensor nodes and Wi-Fi for relaying aggregated data to a backbone network. The APx4 from Bluegiga provides an off-the-shelf solution for this, providing support for both Wi-Fi and the full Bluetooth 4.0 software stack that includes BLE, based around a powerful 450MHz ARM9 processor. A number of integrated microcontrollers and support chipsets from vendors such as Atmel, CSR, Freescale, STMicroelectronics and Texas Instruments provide support for protocols such as BLE, Wi-Fi and ZigBee. For implementations that need flexibility, the configurable radio transceivers made by Lime Microsystems make it easier to deploy nodes that can be programmed with a specific RF interface personality at the point of manufacture to suit different networking needs in the target system. ■

Product News

■ Innovasic: RapID platform for PROFINET IRT

Innovasic has certified the solution for both Class B and Class C. Now it is possible to design in PROFINET with the RapID Platform and take advantage of seamless support for version v2.3. Innovasic's solution allows users to certify their design to v2.3 through any of the PI Test Labs. The PROFINET IRT network interface is delivered as a module or embedded design containing everything needed to participate in a PROFINET IRT and RT network. A host processor connects to the Network Interface via a UART or 16-bit Parallel Interface.

News ID 1447

Smart design of IoT applications using Software Platform Builder

By Harrold Spier and Ulrich Kloidt, Altium

Nowadays billions of people worldwide are connected to the internet with their PCs or mobile devices. One of the upcoming challenges is to extend this computer network to a network of devices which can communicate with human beings, or other devices without human interaction.

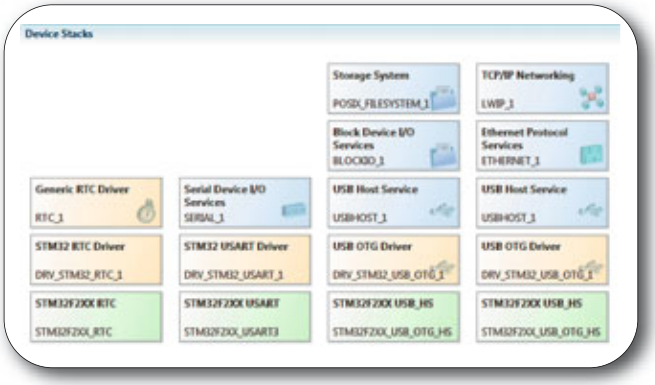


Figure 1. Device stacks

These days the number of applications developed to connect a device with other devices (smart objects) or to store the data they measured in the cloud is growing exponentially. Embedded applications often have limited resources regarding memory, CPU speed and power supply. Therefore, they are developed with respect to these limitations. The connection of smart objects can be realized using different communication channels, depending on what fits best for the area of application. To allow product development engineers to focus on their application needs, it greatly helps not to have to struggle with writing low-level functions for peripheral drivers or communication protocol stacks. Tools which make it easier to develop IoT enabled devices help the embedded software developer to shorten the product development time and thus the market launch of the product. Including a wide range of peripheral drivers and communication services, the Tasking Software Platform Builder can aid in this software development process.

The idea for the Software Platform came in late 2012 when developers asked why developing embedded software takes so much more time than developing a similar desktop application. This seems a legitimate question. Simply showing „Hello World!“ on the LCD display of an embedded evaluation board requires a surprisingly large amount of effort. Driving the LCD, converting characters to pixels, keeping track of the cursor, etc – nothing seems to work automatically. And even if convenient libraries are available, for example for TCP/IP communication, then there is still a lot of work to be done to make the new code fit into the application and to configure it correctly. This cycle often repeats itself for every new project.

So, there had to be a better solution. This challenge motivated us to come up with what we now call the Software Platform. The basic concept is quite simple. Put generic software components in a repository and provide them with a uniform interface. Assure the software components can be configured in a standardized manner. This way, one does not have to know how each component is built up internally. Because of the unified interface, components can easily work together. A graphical environment presents the software components as coloured blocks. Required blocks are picked from the repository to create a starting point for the application. Components can be configured to match the application requirements and relationships between selected components can be specified.

The Software Platform is all about integration of content. It is not the content itself that makes it so special. Much of the current content comes from third parties and can be downloaded freely from the Internet. But creating an application with a bunch of collected software components is not so easy. That is where the Software Platform is helpful. It provides the content in a way they can work smoothly together. All components can be configured in a similar way. And that combination creates the possibility to build reliable applications rapidly.

The Software Platform Builder can be used for the creation of ARM Cortex-M CPU based applications. The Software Platform itself includes various software modules which are added to the application code if needed, like

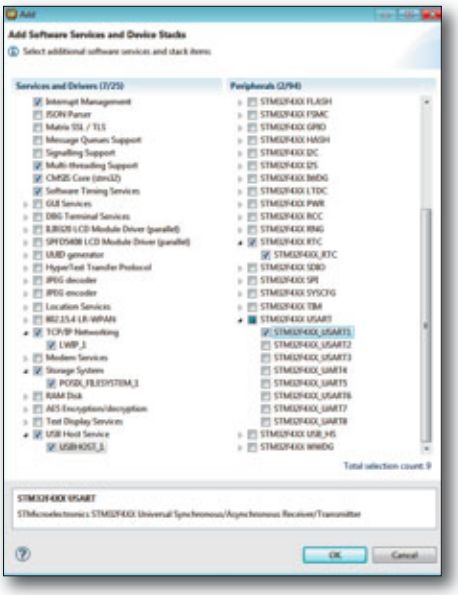


Figure 2. Add software services and device stacks

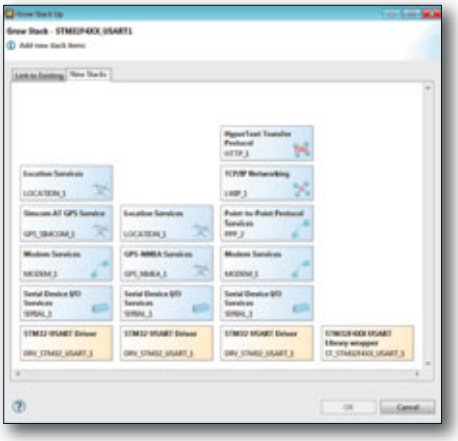
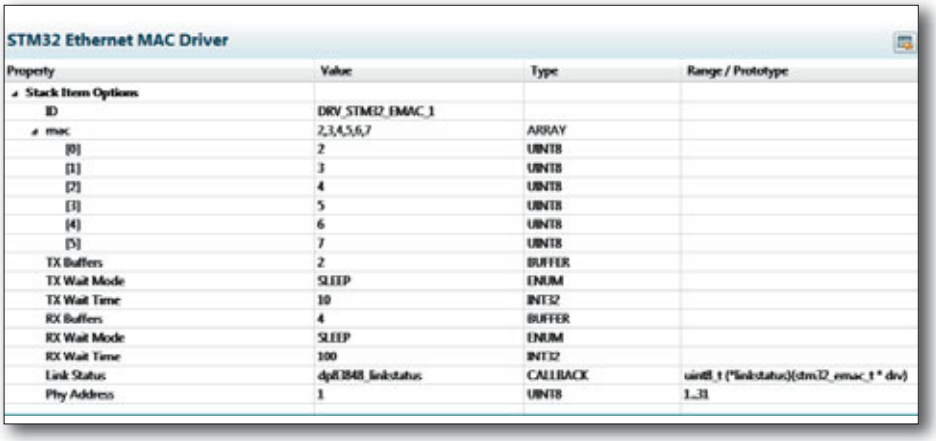


Figure 3. Stack items for USART peripheral



STM32 Ethernet MAC Driver

Property	Value	Type	Range / Prototype
Stack Item Options			
ID	DRV_STM32_EMAC_1		
mac	2,3,4,5,6,7	ARRAY	
[0]	2	UINT8	
[1]	3	UINT8	
[2]	4	UINT8	
[3]	5	UINT8	
[4]	6	UINT8	
[5]	7	UINT8	
TX Buffers	2	BUFFER	
TX Wait Mode	SLEEP	ENUM	
TX Wait Time	10	INT32	
RX Buffers	4	BUFFER	
RX Wait Mode	SLEEP	ENUM	
RX Wait Time	100	INT32	
Link Status	dp83848_linkstatus	CALLBACK	uint8_t (*linkstatus)(stm32_emac_t * drv)
Phy Address	1	UINT8	1..31

Figure 4. MAC driver configuration

RTOS facilities, peripheral access or software protocols. The Software Platform is both a graphical editor and a code generator. Collections of software modules are delivered as Software Platform repositories. The repository may contain any kind of software, but typical modules include interrupt services, timers, peripherals (hardware wrappers), drivers, kernel services (such as POSIX multithreading), device I/O, file system (FatFs), networking (TCP/IP), graphical user interface, etc. The Tasking ARM Cortex tools include a large number of Software Platform reference projects for various STM32 evaluation boards utilizing the available peripherals of the different boards. Software Platform repositories can contain numerous software modules that take care of lower level software routines as well as modules that offer extra functionality by providing the user with a convenient API. The Software Platform consists of device stacks and software services. Device stacks are all about making hardware peripherals available to application code through abstract and generic software interfaces. By placing more or fewer modules on a stack, the abstraction level which should be used in the application is specified. The lowest level modules are specific for a particular hardware device. On top of that, higher level modules can be added which provide more generic functionality to access the device. For example, at the higher, abstract level a module to access a file system in the application can be selected.

Software Platform Repository Reference >

HyperText Transfer Protocol

HTTP interface

Defines

DEFAULT_HTTP_PORT Default port for http connection, port 80

Enumerations

http_error_e Http service error codes
http_status_e Http response status codes
http_method_e Http request codes
http_state_e

Structures

_http_session_s A http session descriptor
_http_status_s A http status descriptor
_http_server_s A http server descriptor

Functions

http_open	Open the http service
http_start	Activate the associated http service
http_stop	Deactivate the associated http service
http_session_initialize	Initialize an http session
http_client_request	Http client request
http_server_init	Initialize the http server
http_server_wait_for_request	Http server, wait for request
http_server_get_request	Http server, get request
http_server_send_response	Http server, send response
http_error_str	Get the error description
http_set_status_callback	Get the http status
http_get_status	Get the http status
http_set_https	Set the protocol to HTTPS

Figure 5. HTTP functions

At the lower levels it is still possible to select modules to decide which specific storage device is accessed (a hard drive, SD card, RAM drive, etc). Thus, the lower level modules are more specific for a particular peripheral while the higher level modules are less hardware-specific and can even be used in combination with multiple peripheral devices. Peripherals (the green stack items) are the lowest level modules. They provide information for the higher layers of the stack to access the peripherals. Information such as the base address and interrupt assignment is stored in the peripherals. In most situations, an application does not access the peripherals directly, because the application accesses them through the driver interface on top of it.

Drivers (the yellow stack items) provide the next level of abstraction. They provide low-level access to specific hardware either via a peripheral or via another driver. The difference between a driver and a peripheral is well defined. The peripheral only defines basic information about the hardware but provides no further functionality. This basic information can be used by a driver which is placed on top of the peripheral. Drivers are hardware specific and so are the interfaces they offer. Hence, if the application contains code that accesses a driver API, it will be hardware dependent. Drivers still operate at a low abstraction level, and using a device at the driver level requires knowledge of that particular driver interface. Some drivers are available as library wrappers. They only offer an initialization routine which is called from an application in order to configure pins, clocks and registers. After this initialization the peripheral driver libraries from silicon vendors can be used.

Stack services (the blue stack items) are the most abstract layers of functionality. Stack services provide standardized, hardware-independent access to devices. Stack services ensure the portability of an application. For example, if the application uses a generic TCP/IP service, it remains the same if Ethernet is replaced with PPP and serial. A portable TCP/IP application works exactly the same, whether linked to a UART or to an EMAC peripheral, since the Software Platform handles the lower level details. Some services are static and not meant to be instantiated. They have no (direct) relationship with peripherals or other services and facilitate common functionality like POSIX multithreading, CMSIS, software timer or interrupt management support. The software services may also be added automatically if they are required by other services.

It takes just a few steps to integrate the Software Platform into an Eclipse-based Tasking ARM Cortex tools project. First the Software Platform document needs to be added to the project. The required software services and device stacks are appended using the 'Add' menu by enabling the related checkbox. After a device stack has been selected in the Software Platform document the available stacks for the device can be chosen using the Grow stack up or Grow stack down option. Figure 3 shows the stack items for the USART interface. Device stacks can be configured by changing the options in the Properties view. Figure 4, for example, shows the configuration options of the Ethernet MAC driver. After the Software Platform is configured, all C files and header files which belong to the devices used are added (copied) to the Eclipse project. If device parameters are changed, the project files can be updated by selecting the Generate Code button. From within the source code of the embedded project the Software Platform functions are called like other C functions. The assignment of the functions, their parameters and also data structures used (if applicable) are described in an online API help. Figure 5 shows a list of the available functions and structures for the HTTP configuration. The Software Platform repository contains several components especially interesting for creating IoT applications.

Since the whole Internet is based on TCP/IP networks, a TCP/IP stack service seems a necessary requirement to be able to communicate over the Internet. The TCP/IP protocol can be on top of an Ethernet layer but there is also the possibility to communicate wirelessly (by using a WiFi USB stick) or over a serial connection using the Point-to-Point Protocol (PPP). This could be a serial cable but also a modem connection, a GSM data connection or even a GPRS connection. On top of the TCP/IP stack the HTTP stack service can be added which, in IoT context, is frequently used for Representational State Transfer (REST). Another benefit of the HTTP service is the ability to support HTTP Secure (HTTPS). Secure communication is important when the application handles sensitive information. It provides encrypted communication to prevent eavesdropping and secure identification of a network web server to know which web server it is really talking to. Some open APIs, like the latest Twitter API, do not even accept non-secure communication anymore.

Representation of the data is also important. Both sides should know how to interpret the data. Although for this purpose XML is used frequently, it is probably not the most appropriate choice for embedded devices. For small devices it is often better to use the JavaScript Object Notation (JSON) format to send data in a structured way. The repository contains a streaming JSON API (SAX-style) which is very useful to parse complex JSON structures without claiming much memory. ■

Product News

■ Altium: automotive safety support program for ISO 26262 certification

Altium announces the immediate availability of their TASKING ISO 26262 Support Program, an offering that assists TASKING compiler users within the automotive industry with ISO 26262 certification. Embedded software forms a critical path in systems such as Driver Assistance, Propulsion, In-Vehicle Dynamics, and Active and Passive Safety Devices. To mitigate the compounding safety risks associated with these embedded systems, the ISO 26262 standard provides guidance along with requirements and processes for testing and certifying automotive embedded software and development tools for safety.

News ID 1362

Energy-harvesting wireless sensor nodes for the Internet of Things

By Matthias Kassner, EnOcean

Energy harvesting wireless is just starting to unfold its potential. The rapid improvement of components will open up new applications in many aspects of life. Together with the Internet moving towards IPv6, the battery-less approach can even form the foundation for an Internet of Things.

■ Over the past two decades, the Internet has evolved rapidly and completely changed our way of life. The initial phase, the so-called Web 1.0, enabled the user to access information that a small number of players have provided. The second phase, often called Web 2.0, at the turn of the year 2000 was no longer only about distributing and presenting existing static content. It rather enabled the user to generate new, individual content and to easily share it with a selected audience. Now, broad-scale Internet usage moves into its third decade enabled by new technologies such as IPv6.

The key difference is that content is now automatically generated and/or consumed. So unlike in the previous waves of Internet usage, one or both parts of the communication can now be machines. Therefore, this third Internet usage paradigm is often called the Internet of Things (IoT). In such a scenario, users will be able to directly access data related to the current situation, followed by calculations in real time and the intelligent control of actuators. The necessary networks built of sensors, actuators and processors can be composed and flexibly modified according to the actual user requirements. In the process, data storage and processing can be done locally or within a cloud-based infrastructure (Infrastructure as a Service – IaaS). The following 3 examples illustrate the concept:

Sensors measure energy consumption and automatically create a website visualising status and trends (content creation by machine, content consumption by human). User instructs the heating system over the Internet to raise the temperature to comfort level ahead of returning home (content creation by human, content consumption by machine). Wireless sensors measure outdoor and room temperature which together with the current weather forecast will be used by the home automation system to calculate the required heating (content creation and consumption by machines).

Having a large network of sensors, actuators and control units all interacting with each other and the user can bring several distinct benefits. More input (sensor) data usually yields a better insight into the system status. This additional information allows a better decision-making process considering a broad range of criteria. Unlike the standard approach of one or more sensors being connected to a central control unit, an Internet of Things allows the sharing and reuse of available information between different partners. Thus, the system collects data only once but uses the information for several applications.

Current control systems are usually local; for example sensors, control unit and actuators are often in close proximity and directly connected with each other (wired or wireless). An Internet of Things no longer requires such proximity. It even allows outsourced computing resources, thus driving down infrastructure cost. Besides this, the IoT allows dynamic creation of control networks which can be formed or dissolved flexibly based on time, location or other parameters.

All required base technologies for such network already exist today – sensors, actuators, local or cloud-based control units and IPv6 to connect all of them together. The major challenge now is how to deploy large numbers of sensor and actuator nodes and connect them in a suitable way. The answer is by wireless (ease of installation and scaling), self-powered (maintenance-free, zero cost of operation) sensor and actuator nodes that can be accessed via IPv6 protocol. Freeing sensors from external power, making them self-powered, opens up unlimited processing and monitoring applications where cables or batteries represent an insurmountable hurdle. These features make energy harvesting wireless technology the ideal solution to easily and reliably interconnect thousands of individual devices in a system and with the Internet. Nowadays solutions predominantly use three energy sources: motion, light and temperature differences. The key challenge with all these energy sources is that they provide very small amounts of energy.

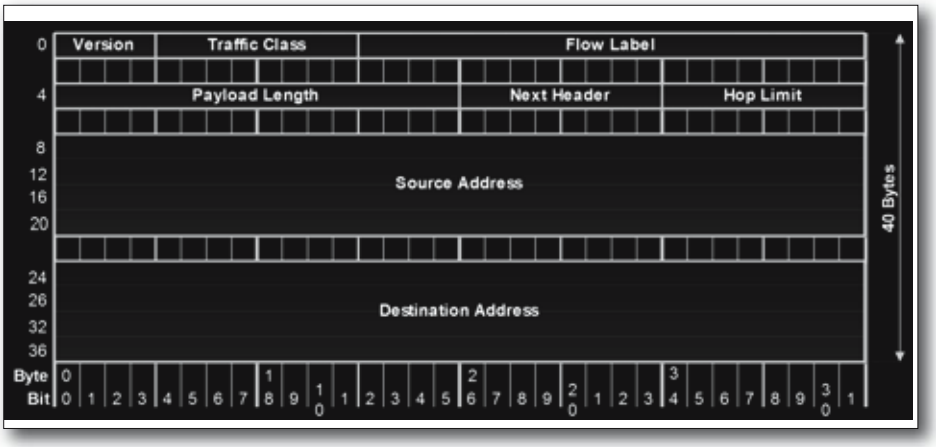


Figure 1. IPv6 header structure

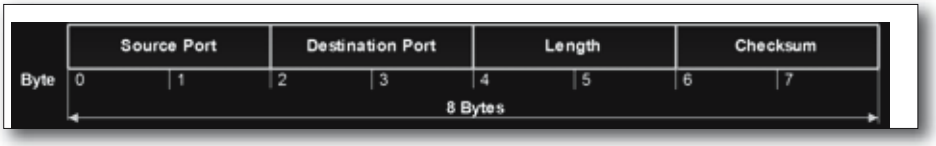


Figure 2. UDP header structure

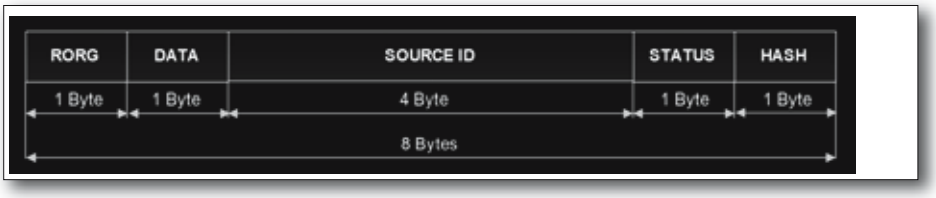


Figure 3. ISO/IEC 14543-3-10 protocol structure

Energy release can occur either in short bursts or as a continuous trickle. In both cases, it typically needs to be accumulated and often converted (to higher voltage levels) to be usable. This places significant challenges on the design of energy harvesting wireless sensor nodes. Specifically, such devices need to have a very energy-efficient system design using a very low duty cycle (devices are sleeping most of the time) and requiring only extremely low standby currents while sleeping. The communication protocol used by such devices needs to be optimised for energy efficiency to minimise their active time.

Since most energy harvesters deliver only very small amounts of power, it is necessary to accumulate it over time while the system is sleeping and to lose only a small fraction of it in the process. Therefore, the most fundamental requirement for such energy-efficient systems is that they have an extremely low idle current. This means that only a very tiny amount of energy is consumed while the system is sleeping. Standard consumer electronics devices today have a standby current in the range of a few milliamperes (mA), whereas power-optimised embedded designs typically achieve standby currents in the range of a few microamperes (µA), an improvement factor of 1,000. In comparison, the latest generation of EnOcean energy harvesting wireless sensors require standby currents of 100 nanoamperes (nA) or less, an improvement factor of more than 10,000. Achieving this level of performance requires very advanced design techniques and extensive optimisation of each individual component.

The second requirement is that the accumulated energy has to be used as efficiently as possible when the system is in active mode. For wireless sensor devices, the two main tasks in active state are to measure an external quantity and to wirelessly transmit information about its value. Both tasks need to be optimised for minimal power consumption. Specifically for the case of the wireless transmission this means that the chosen protocol must be as effective as possible. The payload associated with sensors is often small (a few bytes), therefore the protocol overhead must be limited as much as possible. This last requirement is difficult to achieve while using IPv6 as communication protocol, even on the individual sensor level, because it incurs significant overhead as the IPv6 header alone requires 40 bytes of protocol data (figure 1).

In addition to that, UDP – probably the simplest communication protocol on top of IPv6 – would require an additional 8 bytes of protocol data (figure 2). Based on the IPv6 and UDP header structure, the transmission of 1 byte sensor data would require an additional 48 bytes of low level protocol data. IPv6/UDP is therefore not well suited for energy-efficient communication on sensor level in a network. In comparison, the industry-leading EnOcean protocol for energy harvesting wireless applications in accordance with ISO/IEC 14543-3-10 would incur only 7 bytes of protocol overhead for the transmission of 1 byte of sensor data (figure 3).

Translation between such an energy-efficient sensor protocol and IPv6 is provided by dedicated IP gateways that represent the state of each connected sensor node and act as their representative within the IPv6 network. This approach allows exchanging data with individual sensors even while they are sleeping and therefore are unavailable for direct communication. Upon wake-up, sensors will then update their state information in the gateway and retrieve messages/commands intended for them.

This integrated approach of protocol translation enables all parties to communicate with energy harvesting wireless sensor and actuator networks via IPv6. That way, a protocol such as ISO/IEC 14543-3-10, which is optimised for ultra-low power and energy harvesting wireless applications, can be used for the communication between the sensor and the gateway. This allows the deployment of a broad range of maintenance-free and cost-effective devices which are wirelessly connected. In conjunction with IPv6 gateways, these nodes will form the foundation for the Internet of Things. ■

BLDC motor controllers for simple and complex systems

By Don Laskay, Data Device Corporation

Modern Brushless DC (BLDC) motor controllers housed in compact assemblies are ideal for integration into systems that require precision control and efficiency. This enabling technology fulfils the requirements of both simple and complex motor systems, while offering significant advantages and improving time to market.

Complete enclosed motor controller solution

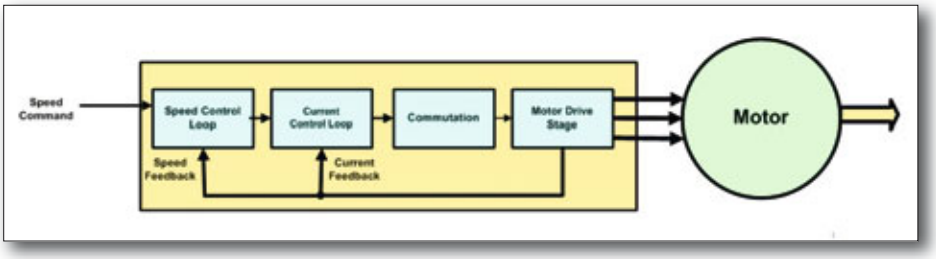
■ The demand for electric motors is increasing at a rate of 5-6 percent annually, and is projected to rise through 2017 to a total available market of $14.4 billion in the US alone. The growth rate is even higher in China and Asia, as these countries modernize and improve infrastructure. Within these markets, the expansion of mid-range horsepower motors outpaces that of smaller fractional horsepower types. Driving this demand are heating and cooling equipment markets, along with electric vehicles, which will provide the best growth opportunities. All systems, from industrial, avionic, military and space are seeing demand to improve efficiency and reduce weight. Along these lines, European markets have issued a directive to improve motor efficiency. Reductions in size and improvements in operating and ownership cost are also being driven in military and avionic markets worldwide. To achieve these goals, more reliable and efficient motors and control techniques must be considered.

The BLDC motor provides clear advantage over other motor types in terms of optimizing efficiency and size in demanding motor applications. BLDC motors do not have brushes and require less maintenance and system down time. Yet these motors require electronic controllers that range from simple to complex. The motors typically have efficiency of over 80%, and the controllers in the 95% range. Thus the enabling technology is the ever improving evolution of the BLDC motor controller. The most efficient controllers use Pulse Width Modulation (PWM) sampling to drive a motor from DC power. There are other power conditioning requirements that range from rectification of an AC signal to electromagnetic interference (EMI) filtering that is required in most applications. Defining and understanding the motor application is essential to selecting the optimum controller choice. The most common motor control techniques and applications can be broken down as follows:

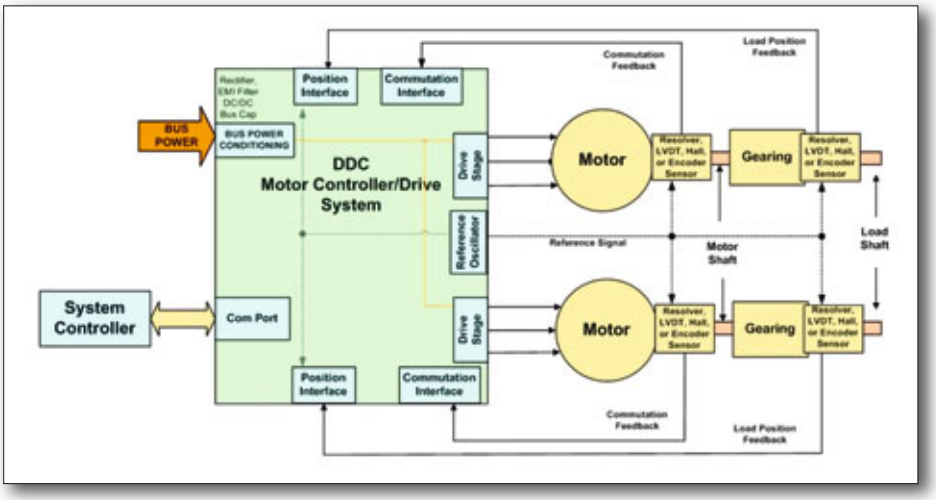
Control	Technique	Applications
Speed	Rotate at constant multiple RPMs	Pumps, Fans and or Compressors
Torque	Maintain force while changing direction	Doors, Wing Slats/Flaps, Fins
Position	Move to precise location	Robotics, Radar, Satellite Communications, Turrets

Each of these systems utilizes specific motor control techniques that require tuning of one or more control loops – torque, speed and/or position. Precision and efficiency is determined on controlling voltage which sets the speed and current that controls the torque. A designer must consider the approaches of analog and digital motor control solutions. Analog motor controllers utilize resistors and capacitors for loop tuning. This typically requires knowledge of control loops and can be supported by data sheets, technical staff and formulas that aid in optimum component selection. Each loops' design characteristics must be chosen carefully.

In the case of a speed and torque controller, the loops must be tuned correctly. These designs are application-specific and can require additional optimization as the system is tested to the full range of performance. Changes are often required as motors and loads are changed or added. The upside to the analog approach is that these motor controllers come in a compact form. The tuning is accomplished by changing resistors and capacitors to set the proportional and integral loop gains of each loop. The compact size of analog controllers is ideal for use in avionic applications due to the size and the cost of certifying programmable devices. Avionic specifications implemented by the Federal Aviation Administration (FAA) in 2005 to ensure the safety of civilian aircraft electronic systems require rigorous design approach and certification. The specifications that are used for design control are as follows. DO254 sets development and compliance standards for complex electronic hardware such as processors, field programmable gate arrays (FPGAs), digital signal processors (DSP), programmable logic devices (PLD), and application specific integrated circuits (ASICs). The levels for this certification range from A: Flight



Sensorless motor control system



Dual-axis motor control

critical to E: Non Flight critical. DO178B sets development and compliance standards for software used in avionic applications.

Analog controllers are also commonly used in space applications to minimize the cost of radiation-proof components such as processors, ASICs or FPGAs. Radiation test and characterization is still required. Total Dose Testing predicts the life of the electronics and Single Event Testing predicts reaction of events such as solar flares. Manufacturers of these devices such as Data Device Corporation (DDC) design to meet common radiation requirements and perform testing to verify radiation tolerance performance. Additionally, hybrid microcircuits save space and weight.

Digital motor controllers offer several performance and efficiency advantages that make them the controller selection of choice for many applications. The versatility of digital controllers has advanced as the evolution of DSP (digital signal processing) and ASIC (application-specific integrated circuit) based processors now enable designers to create flexible products and improve time to market. The most versatile of these designs are based on DSP architectures which allow integration from simpler sensorless systems to complex multi-axis position control systems. The processing power of the DSP, along with associated graphical user interfaces (GUI), takes the complicated math out of the user design, requiring only basic knowledge and support to meet the expected motor system performance goals. The torque, speed and position loops are often calculated for the designer based upon motor and system parameter entry. Many controllers offer multiple control options.

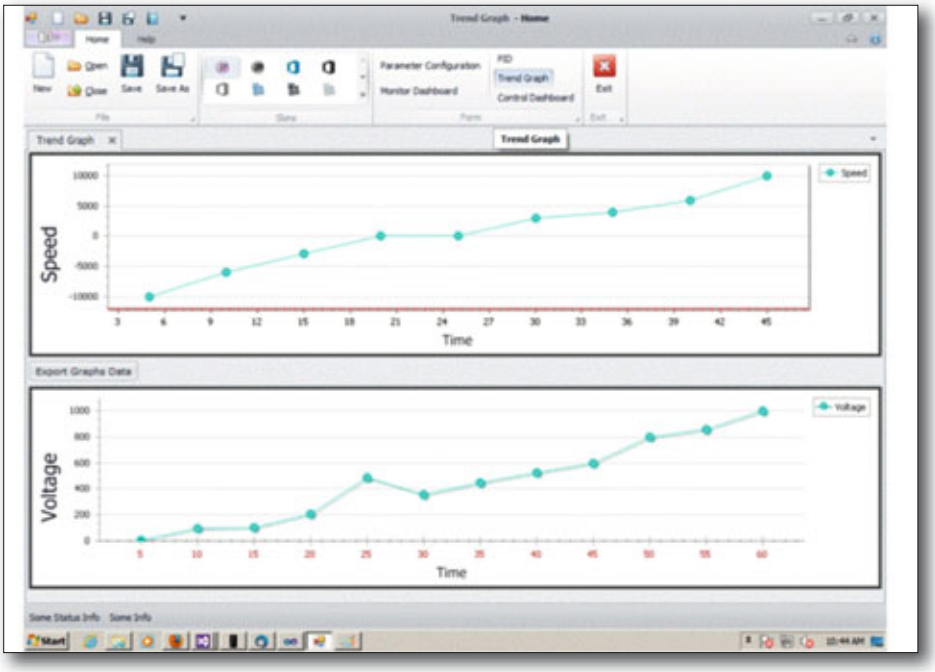
The embedded control and control logic in the DSP can contain complex mathematical calculations and algorithms that are required to gain the efficiencies of the field-oriented (FOC) sinusoidal motor commutation technique. This technique delivers power to the motor by means of a sinusoidal (sine) waveform. The sinusoidal signal provides maximum voltage/speed in relation to the DC bus voltage and reduces noise by over 30% relative to a trapezoidal (trap) drive. The trap drive commutates the motor with a trapezoidal AC signal. The system losses in a sine drive are in the motor, while the trapezoidal drive losses are in the controller. Additionally, a sine wound motor will improve motor efficiencies as well. The torque ripple on a sinusoidal motor can be as low as 1%, while the ripple for a trapezoidal motor is over 13-14%. The sinusoidal system also reduces noise, which is essential to meeting EMI requirements. The trap drive system EMI signature and current ripple are higher due to the sharp edges and flatness of a trapezoidal signal. These signals are modulated by the PWM frequency in the motor controller.

The processing power of DSPs also enables flexible motor control that can be utilized in a wide range of applications, from a sensorless motor system, such as a fan or pump, to a complex multi-axis design, such as those that are used in turrets and robotics. The speed controller uses internal sensing and algorithms that are required for speed regulation and also sets the control loop parameters for torque. Torque is proportional to current and speed is proportional to voltage. The bandwidth for the current/torque loop is generally greater than that of the speed loop.

Torque controllers are used in applications that require holding torque and changes in direction, since these controllers maintain smooth transitions in torque through zero speed. This is known as a four quadrant controller. Controlling current/ torque to the motor will allow for precision speed control. Torque controllers utilize a position sensor on the motor to determine the position of the shaft, in order to energize the appropriate winding for precision control. This is most commonly a Hall Effect device, but can alternatively be resolvers, encoders etc. A position controller utilizes an interface with position sensors on the motor and at the load. The position loop is the outer control loop in this system. The speed and torque loops must be tuned as well. All three control loops must be tuned based on the motor and system parameters.

Programmable motor control devices include a GUI that will aid and perform these calculations based upon the motor used and system requirements. As a system is implemented in the lab or fielded, system parameters often change and may require tuning to attain the desired performance. The GUI is the perfect tool to minimize the time impact of additional tuning. Another benefit of tunable controllers is that a motor can be swapped out and its replacement made operational with the simple change of parameters in a short time. Multiple motors can be used with the same controller. This will reduce the cost of ownership which is a key consideration for motor control systems.

DSP-based solutions also allow for interfacing with host processor controlled systems that communicate on serial networks such as CAN, RS-485, RS-422 etc. Alternatively, speed and/or torque can be set by means of an analog voltage input when advanced features are not required. Also, on-board or system processors can coordinate 2-axis movement as required in satellite base stations, radars, turrets or robotic systems. Motor control suppliers such as Data Device Corporation offer products that incorporate all control algorithms and sensor interfaces, as well as provide advanced protection, such as overtemperature, overcurrent,



Screen shot of a data logger

etc. This is true for both analog/trapezoidal drives and digital/sine drives. These devices have protection built in the hardware. The DSP-based solution also can have soft limits set that interface with the motor control system with parameters set by the GUI. The control and power stages for these motor controllers are available in compact form, such as a hybrid or module, which can be integrated into larger systems.

The controllers and supporting electronics typically are mounted on or near the motor. The motor system will also include a DC bus capacitor to reduce ripple and possibly EMI filters to reduce noise on the system bus. Consideration must also be given to dissipate motor energy Back Electro Motive Force (BEMF) that is generated when the motor shuts down. A large amount of mechanical energy is converted back into electrical energy, and this must be considered in the overall system design with implementation of a braking resistor or other method to store or dissipate this energy such as capacitor networks or batteries. For higher voltage systems, the bus capacitor should be of good quality and low equivalent series resistance (ESR) to reduce bus ripple. This capacitor should be located close to the controller to reduce resistance.

Most electronic systems must meet electro magnetic interference (EMI) standards for system compatibility. This ensures that the electronics will not interfere with or be interfered by other devices. Standards govern the devices radiated radio frequency (RF) emissions as well as susceptibility. There are commercial and military standards such as MIL-STD-461 that is typically used for US military and avionic systems and less rigorous FCC standards in the US. Europe issued an EMC Directive (89/336/EC) in the 1980s and other countries have similar standards. A good motor and controller system will be designed to these standards and have an EMI filter integrated into the system. This can be found located in a box level motor control solution at or near the motor. In a larger system, an overall solution is used. The object is to reduce the cost of qualifying the system as well as meeting control system size and weight constraints.

The DSP-based devices feature graphical user interfaces (GUI) that can operate the motor and be used to optimize performance. Complex calculations are carried out for the control loops. The processor memory also enables users to save motor data, such as voltage and current, which may then be viewed through a data logger for analysis. One can analyze start up issues by reviewing motor current, voltage, as well as optimize the bandwidth to reduce torque ripple to optimize motor performance. These types of tools have become the industry standard, and are included with the purchase of the motor controller.

Modern motor control products will continue to meet the growing demand for automation and motor control, as complex systems can now be supported with compact solutions. These designs provide all the processing power required for precise and efficient motor control, and can easily be integrated into box and system level solutions. ■

■ GE brings supercomputing performance to harsh environments

GE Intelligent Platforms announced the CRS 48.5 HPEC rugged subsystem. A complete, integrated, pre-tested, ready-to-run subsystem enabling faster development/deployment at lower cost and risk, it uses the most advanced VITA 48.5 compliant air-flow through-cooling to allow the integration of up to eight quad core Intel Core i7 processing nodes. This makes it capable of satisfying the most demanding rugged embedded computing requirements such as ISR and electronic warfare in the harshest, most challenging environments.

News ID 1387

■ VadaTech: FPGA mezzanine carriers in AMC form factor

VadaTech has released a full suite of FPGA mezzanine carriers based on Xilinx All Programmable FPGAs. The VadaTech AMC modules come in versions that include Virtex-5, Virtex-6, Artix-7, Kintex-7, Virtex-7 FPGAs and Zynq All Programmable SoCs. These AMC modules come in the single-width size. The Virtex-7 device was also selected for a 100G Processor with an integrated FPGA in the double-module AMC size.

News ID 1388

■ Axiomtek: Intel Core-based 19" touch panel computer with PCI or PCIe slot

Axiomtek announced of the P1197E-861, a ruggedized 19-inch expandable industrial touch panel computer. The P1197E-861 supports 3rd Generation Intel Core i7/ i5/ i3/ Celeron/ Pentium processors in LGA1155 socket with the Intel H61 Express chipset. The P1197E-861 is equipped with a 19-inch SXGA TFT LCD display with high brightness LED backlight (350nits), and has an IP65/NEMA 4 compliant front panel.

News ID 1391

■ Avalue launches new 3.5" micro module

Avalue is unveiling ECM-DX2, which is highly integrated, low power consumption design, fanless operation and extended temperature. ECM-DX2 has adopted the DMP's Vortex86DX2 4.5W @ 800MHz SoC solution which is the 3rd generation SoC of Vortex86 family. The ECM-DX2 supports onboard DDR2 memory that supports up to 32bit 1GB and supports single channel 24-bit LVDS (optional 18-bit) as well as VGA+LVDS or VGA+TTL multi-display configurations.

News ID 1367

■ RUTRONIK bundles its portfolio of boards, storage, displays, wireless modules and auto ID

Rutronik bundles its portfolio of embedded boards, storage, displays, wireless modules and auto ID components as well as specific peripheral components under RUTRONIK EMBEDDED. 'Best-fit' kit solutions of board, memory and display offer optimally tailored solutions and a very short time-to-market. The comprehensive range of components is complemented by support from the component selection and production through to RMA / PCN / EOL services.

News ID 1512

■ DSM: 4U 19-inch system with Intel Core processor of the 4th generation

The 4U 19-inch Infinity 96I4408-MBQ87 system from DSM Computer integrates the Intel Q87 desktop chipset and desktop versions (S series) of the Intel Core processors of the fourth generation. This makes the robust industrial computer particularly suitable for sophisticated applications that demand high computing, graphical and video power.

News ID 1355

■ Tiny Green PC: miniature fanless PC for signage and telecomms

Tiny Green PC has launched the fit-PC3i; based on the tiny, robust, fanless, ultra-low-energy fit-PC3 compact computer, it brings superior graphics performance and excellent connectivity to digital signage, surveillance and telecommunications applications. The fit-PC3i offers all the features of the fit-PC3, enhanced with an on board SIM socket, integrated fit-Headless HDMI plug, dual GbE networking and CEC support for the dual HDMI graphics channels.

News ID 1351

■ ARBOR: COM Express family powered by AMD G-Series SoC

ARBOR Technology has expanded its COM Express product range by adopting the AMD dual core G-Series SoC processor which provides higher performance with low power consumption. The EmNANO-a56M0 is a Mini Type 10 CPU module, and is suitable for the applications require high graphic and interactive processing include medical equipment, security & surveillance, gaming, digital signage and 3D display.

News ID 1347

■ EKF: PCI Express mini card carrier supports LTE, WiFi, GNSS

EKF introduces the SP4-MAMBO, a peripheral board for CompactPCI Serial systems, which serves as a quad PCI Express Mini Card carrier, either full- or half-size style. An additional socket is provided for an optional mSATA module. Up to six SMA antenna connectors are available via the front panel, for MIMO operation of wireless Mini Cards, such as WiFi (WLAN) or GPRS/LTE (WWAN). Any module socket is wired to an individual Micro SIM card holder.

News ID 1369

■ IBASE: stainless steel Panel PC series with 19" or 15" LCD display

IBASE presents the new panel PC series: INOSP, stainless steel panel PCs with 19" or 15" LCD display. The new series utilizes the dual-core 1.86GHz Intel Atom Processor D2550 in a fanless enclosure, providing high computing and reliable performance. IBASE will launch the 19-inch INOSP-191-RE model in May and the 15" INOSP-151-RE counterpart in June of this year.

News ID 1522

■ ADLINK: Atom and Celeron SoC from SMARC modules to rugged systems

ADLINK announced an array of new products in various form factors based on the latest Intel Atom and Celeron processors for intelligent systems, featuring a significant performance per watt improvement over previous generations, high integration of both low speed and high speed IO's, an advanced graphics engine, and virtualization support — all on a sub-10-watt that enables small, light, and reliable embedded designs.

News ID 1363

■ Avalue: Intel Atom E3800 based product family of embedded boards

Avalue Technology announce the Intel Atom processor E3800 based family of embedded boards, including ECM-BYT, EBM-BYT and EQM-BYT. These boards are powered by the newest Intel Atom processor E3800 product family, a system-on-chip. Based on the 22nm Silvermont microarchitecture, these new processors are designed for intelligent systems and applications with low power consumption and high performance requirements.

News ID 1469

■ MEN: PX4 mini card for mobile audio transmission

The new PX4 can be integrated into MEN Micro's full line of rugged, flexible box PCs. This allows voice and phone functionality across many popular communication networks to be easily incorporated into a mobile system. Developers no longer need to implement a separate, costly audio system that enables the driver to call the control room or the control room to make an announcement to the passengers, for example.

News ID 1470

■ VadaTech: new MCH transforms capabilities of MicroTCA-based systems

VadaTech now offers a MicroTCA Carrier Hub with a 40GbE option, synchronous Ethernet, and advanced clocking/GPS capability. The new MCH is VadaTech's 3rd generation module with several unique features that will transform the capability of a MicroTCA-based solution. The UTC004's 40GbE option is a 4x boost in

performance from today's 10GbE solutions. The MCH also provides PCIe Gen 3, SRIO Gen 2, and a crossbar switch option. The CBS allows any fabric to be utilized including custom solutions.

News ID 1506

NAT: power supply for MicroTCA achieved class A and class B certification

N.A.T. announces that the NAT-PM AC600, a 600WAC power supply for MicroTCA systems in single-width full-size form factor has successfully passed EMC tests for Class B according to EN55022 and safety tests according to EN68950. The NAT-PM- AC600 is the only AC power supply for MicroTCA in this form factor and being class A and class B certified makes the NAT-PM-AC600 a unique solution for any MTCA.0 and MTCA.4 based applications.

News ID 1463

Advantech: fanless out-of-the-box solution for Internet of Things

Advantech and Intel are launching UTX-3115 coupled with the Intel gateway solutions for internet of things. The solution features a pre-integrated software and hardware platform containing a Linux operating system, security and management features. This out-of-the-box solution simplifies customer deployment of IoT products; and it allows secure data aggregation, filtering, and analysis from edge devices to the cloud through WiFi and/or even 4G technologies.

News ID 1460

IBASE: network appliance based on Atom C2000 family with Intel QuickAssist

IBASE launches the FWA6404 network appliance featuring four high-speed Gigabit LANs and support for the new Intel Atom processor C2000 family and Intel QuickAssist technology. Built in a 1U rackmount chassis, the FWA6404 is designed for various networking applications requiring high computing performance and big bandwidth applications.

News ID 1475

Advantech: 3.5" MI/O Extension fanless SBC based on Intel 4th generation Core i5/Celeron

Advantech announced its MIO-5271 SBC in a 3.5" MI/O Extension(146 x 102 mm) form factor, based on Intel 4th generation Core i5/Celeron processors. It supports 1600/1333MHz DDR3L, USB 3.0, SATA up to 6Gb/s (600 MB/s), Intel AMT 9.5 Release, and has triple independent display capability. Advantech has developed an optimized thermal solution for MIO-5271, making fanless design possible on this kind of compact, high performance platform.

News ID 1435

Langer: system for comparative EMC measurements

Langer EMV-Technik introduced ESA1, a measurement system for comparative EMC measurements, which will help you make targeted and efficient progress in the development of modules or devices. The ESA1 allows you to perform measurements directly at your workplace in the course of developments, you will save time and costs over the entire development process. EMC measurements carried out with the ESA1 are similar to far-field measurements so that improvements to the device under test that have been identified with the ESA1 and then implemented have a proportional effect on the result of the far-field measurement.

News ID 1394

Kontron: multiscreen live transcoder and VoD transcoder

Kontron and Vantrix announced two new high performance transcoding products: a multiscreen live transcoder and VoD transcoder. Both companies redefine multiscreen video transcoding performance. Vantrix's software is installed as a virtual appliance and operates on Openstack, enabling flexibility and scalability. A single appliance can run concurrent applications, such as Live and VoD transcoding, DRM encryption, and streaming with selectable resource assignments for different uses.

News ID 1451

EKF: peripheral slot board for CompactPCI serial systems

The SK1-CHORD is a peripheral slot board for CompactPCI Serial systems and acts as carrier card for a PMC-style mezzanine module. PMC modules are provided with a legacy PCI interface and are widely in use for industrial and scientific applications. The SK1-CHORD supports the most common 32-bit 33/66MHz PMC modules. The SK1-CHORD is equipped with a PCI Express to PCI bridge for conversion of data from the CompactPCI Serial backplane, to the on-board PCI parallel bus. The PMC module fits on the PMC connectors J11/J12 at 10mm height. The SK1-CHORD can be installed into any peripheral slot of a CompactPCI Serial backplane.

News ID 1479

VadaTech: MicroTCA.4 chassis solves power redundancy problem

VadaTech offers an 8U high chassis compliant with the MicroTCA.4 specification that offers N+1 redundant power to 4400W. MicroTCA.4 systems utilize double modules with an RTM connector for rear I/O. By adding RTM and higher power large modules, the overall power requirement in chassis are higher. Many High-Energy Physics and other applications require full power redundancy in the system.

News ID 1481

■ MSC: medical PCs from Avalue

MSC Technologies announced Avalue's AID-173 series of medical PCs that combines a medical monitoring and diagnostic solution with infotainment for patients. It enables authorised medical staff to view electronic patient records and retrieve medical information, X-rays or other documents. It also incorporates infotainment functions, allowing the patient to use a wide range of multimedia such as entertainment, telephone, games and the internet.

News ID 1398

■ MEN: 3U CompactPCI board with 16 digital I/O channels for railway applications

The new 3U CompactPCI board F403 with 16 bidirectional digital I/O channels has been designed specifically for modern railway applications. The new board is suited for many different control functions, such as door-locking control and interior lighting. The new F403 supports a total of 16 bidirectional digital I/O channels, organized into four optically isolated groups for reliable data transmission with four channels in each group.

News ID 1500

■ Axiomtek: high-performance PICMG 1.3 half-size single board computer

Axiomtek introduce SHB230, its high-performing PICMG 1.3 half-size single board computer. The SHB230 based on the Intel Q87 PCH is designed to support 4th Generation Intel Core i7/i5/i3 and Celeron processors in the LGA1150 socket. The slot CPU card is equipped with two DDR3-1333/1600 SO-DIMM sockets up to 16 GB memory capacity. The PICMG 1.3 specification brings advantages of PCI Express to this single board computer that offers four PCIe x1 or one PCIe x4, and one PCIe x16 routed to the backplane. The onboard two SATA interfaces support RAID 0/1 functions to ensure reliable storage for multiple applications. Axiomtek's SHB230 supports SATA RAID, Intel Active Management Technology 9.0, and

News ID 1441

■ Wind River: Toshiba is using Simics to develop automotive application software

Wind River announced that Toshiba is using Wind River Simics to develop automotive application software on image recognition system-on-chip platforms. Providing full system simulation and breakthrough development techniques, the added Simics capabilities can help Toshiba's automotive customers increase their productivity by transforming their software development processes to be faster and more efficient. The Toshiba image recognition SoCs, the TMPV75 Series, are applicable to advanced driver assistance systems with automotive video cameras.

News ID 1465

■ Softing: enhanced modbus gateway and linking device

Softing's modbus gateway and linking device FG-110 FF for the integration of FOUNDATION fieldbus segments in existing plants and in Modbus control systems has been enhanced with two new features „Configuration Upload" and „Firmware Download". The new features will significantly simplify the configuration effort needed to expand an H1 system and enable system integrators and control engineers to update the field device firmware from a central location.

News ID 1410

■ TI: Sitara software development kit based on Mainline Linux kernel

TI provides a robust, stable Mainline Linux kernel for developers using Sitara processors. To ensure high quality, TI collaborates with the Kernel.org community for code reviews with stringent acceptance criteria. TI also continuously stress tests the Linux kernel across various customer use cases and applications to guarantee stability.

News ID 1409

■ LieberLieber: graphical UML debugger integrates into Enterprise Architect

enar uml debugger is a graphical UML debugger which integrates into Enterprise Architect. The product enables testing and debugging of software modeled in UML or SysML right at the model layer. enar uml debugger is part of the LieberLieber product chain targeting software development for embedded systems and is based on enar uml2code, the code generator developed for generating platform independent code from UML state machines and activity models.

News ID 1399

■ DDC: real-time ARINC 429 data bus analysis and simulation

Data Device Corporation adds real-time data manipulation to the already feature packed ARINC 429 Data Bus Analyzer avionics software. Scheduled ARINC 429 data can now be modified while running. This powerful feature allows test engineers and system designers to extensively test and emulate avionics systems using simulated flight data that accurately emulates airborne conditions.

News ID 1471

■ GE works with NVIDIA on Tegra K1-based HPEC solutions

GE Intelligent Platforms announced that it has signed an agreement with NVIDIA to bring products based on the NVIDIA Tegra K1 mobile processor to the embedded computing market. GE Intelligent Platforms will develop and manufacture rugged high performance embedded computing (HPEC) and graphics solutions based on Tegra K1. GE will be NVIDIA's preferred provider of the new technology to serve applications in harsh environments, most notably to customers in the military/aerospace market.

News ID 1386

■ ARBOR: robust 1U embedded computers with AMD G-T40N platform

ARBOR announced its new 1U-height fanless, embedded computers to expand its ARES-1500 series, based on dual-core AMD Embedded G-T40N APU, combined with the AMD A50M chipset, allows end users to have a robust platform. The new embedded computers offer operating temperature range of -25 to 55°C range and provide a fanless as well as cable-free design, making them unique for industrial use.

News ID 1502

■ HCC Embedded: MISRA-compliant embedded SSL/TLS package

HCC Embedded announced the release of a SSL/TLS implementation designed for use in high quality, high performance embedded applications. When used in conjunction with HCC's MISRA-compliant TCP/IP stack, it provides a combination of verifiable quality and speed and memory utilization. The new SSL/TLS implementation can be used as client or host and is designed especially for microcontrollers, ensuring a low memory footprint, typically around 20kB ROM / 8kB RAM.

News ID 1407

■ Mouser: evaluation kit for Atmel's ARM Cortex A5 based processors

Mouser Electronics is now stocking and shipping the Atmel SAMA5D3 Xplained Evaluation Kit, a low cost prototyping board for the Atmel SAMA5D3 family of processors based on the ARM Cortex A5 processor core. The board supports an external LCD interface, Gigabit Ethernet, and Arduino R3 expansion headers. The Atmel SAMA5D3 Xplained Evaluation Kit available from Mouser Electronics is Atmel's latest in a series of SAMA5D3 evaluation boards.

News ID 1488

■ Softing: process data integration via embedded OPC UA server

Softing Industrial Automation announces the release of "echocollect UA", a modern, standardized solution for the acquisition and management of process, manufacturing and quality data via an embedded OPC Unified Architecture (UA) Server. echocollect UA is designed as a versatile gateway with OPC UA interface. It independently collects data from programmable controller systems (PLC) and delivers it to a higher-level management system (e.g. ERP or MES) directly via the integrated embedded OPC UA server.

News ID 1417

ADLINK: COM Express module with 4th Generation Intel Core processor

ADLINK Technology rolled out a COM express Type 6 module, adopting the 4th generation Intel Core processor and delivering CPU performance, graphics, and improved security functions. The ADLINK Express-HL is among the first products delivering the computing power of Intel's newest generation Core processor family. The new module is well suited for intelligent systems innovations in a variety of market segments, such as retail, medicine, gaming, transportation, defense, communications, and industrial automation.

News ID 1396

Silica: reference board with Freescale i.MX 6Quad applications processor

SILICA is expanding its ArchiTech family of development and reference boards with the introduction of a high-end system based on the Freescale Semiconductor i.MX 6Quad applications processor. The Tibidabo development platform comes with SDK, Linux images and a board support package based on Yocto to reduce development time. As well as its quad ARM CortexTM-A9 CPU clocked at 800 MHz, the Tibidabo board carries a host of features to satisfy developers targeting high-end embedded applications such as digital signage, automotive infotainment and gaming.

News ID 1425

SYSGO: extensive testing on the next version of ELinOS

SYSGO is working on the new 6.0 release of ELinOS. In addition to its own in-house test suites always used for new versions, SYSGO is using an extensive test suite provided by OSADL which focuses on stability and capabilities of the real-time Linux kernel. Months before its official release, ELinOS 6.0 has been integrated into the OSADL Realtime QA Farm, a set of industrial boards and Linux programs configured to perform quality checking. The pre-release of ELinOS is running on a phyFLEX i.MX 6 platform from Phytec.

News ID 1427

Axiomtek: Box PC with Intel Core processor for railway environments

Axiomtek offers advanced industrial-grade and ruggedized box computers and panel computers that are in compliance with railway standards and related regulations. Axiomtek's advanced tBOX321-870-FL adopts onboard high-performance Intel Core processor and onboard DRAM which greatly reduce the impact of vibration and shock in railway environments. It is certified with EN50155/EN50121 for rolling stock, and complied with EN45545-2 for fire resistance which greatly advancing the system performance and reliability.

News ID 1345

IAR adds stack usage analysis to its development tools for Renesas RX

IAR Systems announces a new version of its development toolchain IAR Embedded Workbench for RX. Version 2.60 contains stack usage analysis functionality and several other new features that make the world-leading toolchain for Renesas RX microcontrollers even more powerful. Calculating the stack space is notoriously hard for all but the smallest embedded systems. Worst case maximum stack depth is very useful information in most embedded projects, as it greatly simplifies estimates of how much stack an application will need. With stack usage analysis enabled in IAR Embedded Workbench for RX, a stack usage section will be added to the linker map file with listings of the maximum stack depth for each call graph root.

News ID 1501

NI: USRP RIO next-gen wireless prototyping platform

National Instruments announced an integrated software defined radio solution for rapidly prototyping high-performance, multichannel wireless communication systems. The NI USRP RIO platform is built on the NI LabVIEW RIO architecture and combines a high-performance 2 x 2 multiple input, multiple output RF transceiver capable of transmitting and receiving signals from 50 MHz to 6 GHz with an open LabVIEW programmable FPGA architecture.

News ID 1486

Green Hills: INTEGRITY RTOS for ARM-based processors

Green Hills Software announce INTEGRITY-178 tuMP real-time operating system for ARM-based processors. Company's partner Richland Technologies also announced the industry s first Open Standard Reconfigurable and Certifiable Computing Architecture avionics computer based on an ARM multicore processor and INTEGRITY-178 tuMP. It significantly improves the flexibility in how the ARM processor cores can be used.

News ID 1456

Green Hills Software: enhanced version of Green Hills Compiler

Green Hills Software has announced a new release of its Green Hills Compiler. New optimisations in Green Hills Compiler 2014 extend the Green Hills lead over other compilers in automotive software, as demonstrated by up to 10% improvement compared to latest published EEMBC Automotive benchmarks. Also renowned for its market-leading robustness, the tool is the only commercial compiler certified to the stringent IEC 61508 Safety Integrity Level 4 and ISO 26262 ASIL D.

News ID 1423

■ ITTIA: DB SQL advances in-memory data management for Embedded systems

ITTIA announces new capabilities of ITTIA DB SQL that empower embedded systems to store a large volume of data in-memory for processing and analysis. Applications use this technology to find specific details in a very large data set and perform complex queries in seconds. Storing and retrieving large amounts of data constitutes an important aspect of managing any business. Decision-makers are constantly challenged to extract insight from real-time data to increase productivity.

News ID 1524

■ Wind River: VxWorks MILS platform for avionics communications system

Wind River announced Lockheed Martin relied on Wind River VxWorks MILS Platform to provide a separation kernel-based security foundation for its new avionics communications system that was recently flight-tested. Lockheed Martin's independently funded research and development effort, called Project Missouri, demonstrates how an open system architecture enables quick and affordable integration of new capabilities on multiple platforms without major changes to the aircraft.

News ID 1450

■ dSPACE: SYNECT data management software with model management

Version 1.3 of the dSPACE SYNECT data management software adds powerful model management to its test, signal, parameter and variant management for model-based development. Engineers, software developers and architects using model-based design can now manage system, function and plant simulation models together with the associated interface data, parameters and files.

News ID 1473

■ Micro Digital announces smx vs. FreeRTOS comparison

Micro Digital has completed a detailed comparison of smx, a commercial RTOS kernel, to a typical free generic kernel called FreeRTOS. Many people in the embedded community believe that RTOS kernels are all equivalent. This comparison shows that smx offers many more and better features than a typical generic kernel. What is not in the kernel must be developed in the application

News ID 1359

■ SILICA: development board with Linux optimised for Renesas RZ/A1H MCU

SILICA is launching a new ArchiTech development board that offers a low cost streamlined platform for Linux based designs. The ArchiTech Hachiko board is supplied with a Linux kernel optimised for the Renesas RZ/A1H MCU, to work with a small memory footprint together with a BSP for the on-board peripherals, minimizing development time.

News ID 1373

■ Altium partners with Octopart in Developer Program for Altium Designer

Altium announces a third party developer partnership with Octopart, a provider of an electronic parts search engine. Around 70-80% of the life cycle cost for a new product is a direct result of decisions made during the design phase. This is because designers are creating a blueprint for everyone else to follow and is the reason why it is very important to have the right information to make prudent decisions early in the design process.

News ID 1371

■ Atego combines model-based systems and software engineering

Atego has launched Atego Vantage, an integrated solution combining Model-based Systems and Software Engineering, Asset-based Modular Design and variable Product Line Engineering. The combination of these three proven approaches into Model–based Product Line Engineering can reduce development costs by 62% and bring 23% more projects in on time.

News ID 1365

■ IAR Systems: updated version of development tools for Freescale HCS12

IAR Systems releases an updated version of its complete development toolchain IAR Embedded Workbench for HCS12. Plenty of new functionality is added to further improve ease of use and make the workflow more efficient for developers working with the 16-bit HCS12 microcontrollers from Freescale. In addition, the IAR C/C++ Compiler incorporated in IAR Embedded Workbench for HCS12 now uses the ISO/IEC 9899:1999 standard, known as C99, as the default C language.

News ID 1404

■ SYSGO: integration of PikeOS with Lauterbach's TRACE32 debugger tool

SYSGO is announcing a new integration of its certified RTOS/hypervisor PikeOS with Lauterbach's TRACE32 Debugger tool that supports the debugging of ELinOS, its embedded Linux product, running as PikeOS' personality. PikeOS developers were already able to use TRACE32 from Lauterbach, a debugging capability that applies to a full range of items, from bootstrap code to interrupt routines and drivers. The new version of Lauterbach's Kernel awareness provides now the possibility to debug any thread of ELinOS, used as PikeOS Linux Personality, and in SMP mode if needed.

News ID 1457

boards & solutions ECE

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Schroff: online system selection tool

Schroff VME, VPX, VXS, CompactPCI, CompactPCI Serial and MicroTCA systems from Pentair are configured to customer specifications from off-the-shelf parts and components including cooling and power supply, etc. The modular design of these products allows some 95% of all customer requirements to be catered for. The remaining 5% can be served by making simple modifications to the standard systems.

News ID 1389

Xilinx: SDNet software defined specification environment

Xilinx announced the industry's first solution for "Softly" Defined Networks, expanding programmability and intelligence from the control to the data plane. The design of the programmable data plane functions is enabled by the new Software Defined Specification Environment for Networking, with functional specifications automatically compiled into Xilinx's All Programmable FPGAs and SoCs.

News ID 1402

ETAS: test operations services for embedded systems

ETAS, a leading provider of solutions for embedded automotive systems, announced the launch of ETAS Test Operations Services as a new area, offering complete test specification, implementation, execution, analysis and reporting services for embedded systems in the automotive and commercial vehicle industries.

News ID 1382

Imagination: WebRTC media engine with enhanced voice/video conferencing

Imagination Technologies introduces an innovative WebRTC media engine that promises to deliver a new level of quality to companies building native or browser-based voice and video conferencing services based on WebRTC. Imagination's HelloSoft WebRTC engine with its unique, proven algorithms provides enhanced voice and video quality for a superior user experience across mobile and tablet platforms.

News ID 1482

TI: programmable microcontroller solution to handle resolver-to-digital decoding

Texas Instruments announces the C2000 MCU Resolver Kit, its first programmable microcontroller solution to handle resolver-to-digital decoding.The C2000 MCU Resolver Kit shows designers how to implement the digital conversion using software on programmable C2000 MCUs, saving system cost and space in a variety of industrial applications, including robotics, servo drives, automation, avionics and transportation.

News ID 1452

Apacer rolls out SATA 3 SSD with storage capacity of 1TB

In order to respond to the worldwide rapid growth of Cloud and Big Data, Apacer launched SATA 3 large capacity SFD 25H-M SSD. It possesses a storage capacity of 1TB, with sequential read/write speed of 510/420MB/sec, marking a significant specification enhancement and an advance to virtualization technology of Big Data storage. Enterprises' overall data processing performance will be strengthened.

News ID 1510

Freescale: QorIQ multicore processors family

Freescale Semiconductor is introducing the QorIQ LS2085A and LS2045A SoCs based on Layerscape architecture. The QorIQ LS2 incorporates a processing domainbuilt around the industry-leading 64-bit ARM Cortex-A57 core. Tightly coupled to this domain is a set of debug, I/O and acceleration technologies, including a packet processing engine that abstracts hardware complexity and enables customers to focus their resources on innovation at the application level.

News ID 1446

Bluetechnix: automotive image sensor module

The newest Bluetechnix image sensor module ISM-AR0132AT combines high-dynamic-range and 60 fps recording. Its sensitivity exceeds the human eye as well as it exceeds the comfort zone of most human observers with a range of operation temperature from -40 to +85°C. The ISM, which is based on an 1280 (H) x 960 (V) Aptina-AR0132AT, will therefore operate and collect detailed, precise and true-color information even in adverse weather or light conditions.

News ID 1434

Maxim: single-phase electricity meter SoC

Using the ZON M3 (MAX71315) single-phase electricity meter SoC from Maxim Integrated Products, engineers now have a highly accurate, low-cost design system for e-meters and solid-state meters. Automotive Superior metering metrology is essential for accurate monitoring and billing. The ZON M3 energy-meter solution integrates four 24-bit ADCs for 4-channel data collection and ±0.1% measurement accuracy over 5000:1 dynamic range.

News ID 1466

SEGGER: J-Link now supports Microchip's PIC32 family microcontrollers

J-Link now fully supports direct debugging via JTAG on Microchip PIC32 devices. This includes support for the IEEE 1149.2 traditional 4-wire JTAG interface and the Microchip proprietary 2-wire JTAG interface. Debugging via 2-wire JTAG is supported on all 2-wire JTAG compliant PIC32 devices. To start using the J-Link with PIC32, the only thing required is a current J-Link model and the Microchip adapter.

News ID 1401

Atlantik presents Holtek s blood glucose meter flash MCU

Atlantik Elektronik presents the HT45F65 and HT45F67, Holtek's new electronic glucose meter flash MCUs that will enhance the presence of Holtek's products in the medical instrumentation product application area. The devices contain a high accuracy programmable reference voltage, a dedicated operational amplifier as well as an A/D converter and temperature sensor functionality.

News ID 1390

Freescale: Kinetis microcontrollers for motor control and digital power conversion

Freescale Semiconductor introduces the new Kinetis V series, optimised for motor control and digital power conversion applications and the Kinetis Motor Suite, a bundled enablement tool that helps to maximise motor efficiency while reducing development cost and time to market. Both are based on ARM Cortex-M processors.

News ID 1433

Atlantik Elektronik presents blood pressure meter flash MCU

Atlantik Elektronik presents the HT45F3W, Holtek s new electronic blood pressure meter flash MCU that will enhance the presence of Holtek s products in the medical instrumentation product application area. The device contains multiple fully integrated amplifiers with programmable gain and bias values as well as a 13-bit A/D converter and a constant current generator. Additionally, the HT45F3W also features a charge pump and regulator functions.

News ID 1358

TI: flyback power devices with PSR achieve sub-30-mW standby power

Texas Instruments introduced two flyback power solutions that achieve the highest energy efficiency and lowest standby power consumption for 5- to 100-watt AC/DC power supplies. The UCC28910 700-V flyback switcher and UCC28630 high-power, Green-Mode controller expand TI's leading portfolio of flyback controllers covering the complete power range of AC/DC adapters and power supplies used in personal electronics, printers, white goods and smart meters. Combining high density with high efficiency, TI's UCC28910 switcher with integrated high-voltage power MOSFET achieves the industry's best stand-by power consumption for 5- to 10-W designs and features the lowest constant-current output tolerance of 5 percent, providing an accurate, maximum current across different input voltages. Additionally, the UCC28630 controller's ability to support primary side regulation technology improves reliability in 10- to 100-W power supplies.

News ID 1343

Wibu-Systems announced "Protection Suite"

Wibu-Systems announced its „Wibu-Systems Protection Suite". The suite includes the all-in-one CodeMeter encryption and licensing tool that enables manufacturers to quickly and easily protect their ready-made software and their know-how against piracy and reverse engineering, and safeguard their equipment from tampering or cyber-attacks. The Suite also includes the automatic "AxProtector" encryption tool for software applications, and "ExProtector", an encryption tool specially designed for embedded operating systems.

News ID 1418

Digi-Key: ISO 14001 certification underscores green initiatives

Digi-Key announced its continued efforts around sustainability and environmental management. The company has put into place a series of green initiatives including ISO 14001:2004 certification, environmentally friendly packaging, company-wide policies and best practices around reducing energy, waste, and paper usage, as well as increased recycling awareness.

News ID 1487

Microchip: highly integrated, automotive AEC-Q100-qualified motor driver

Microchip announces the MCP8063, a highly integrated, automotive AEC-Q100-qualified motor driver in a small, 8-pin, 4x4 mm DFN package. It is also combine all of those features with 1.5A peak phase current for the 180-degree sinusoidal drive of a variety of three-phase brushless DC motor and fan applications.

News ID 1443

Green Hills Software: security services for Internet-of-Things

Green Hills Software launched a new services group, IoT Security Advisors, comprised of security experts from all of Green Hills Software s business units to provide security services for organisations that must manage the daunting privacy and security challenges associated with the IoT.

News ID 1415

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How to build robust and scalable M2M infrastructures for the Internet of Things

This webinar examines the differences between IoT and M2M, and the critical characteristics needed in any system that is to be deployed for Internet of Things applications. Eurotech has over 15 years of experience in building M2M systems based upon paradigms that have since been gathered together and become known as the Internet of Things. Today, this critical knowledge is distilled into an integration platform and device framework which does the heavy lifting for users wanting to build and deploy reliable managed M2M solutions where data can be easily shared between devices, applications and stakeholders.

Advanced power management helps bring improved performance to highly integrated x86 processors

Complex heterogeneous processors have the potential to leave a large amount of performance headroom untapped when workloads don't utilize all cores. Advanced power management techniques for x86 processors are designed to reduce the power of underutilized cores while also allowing for dynamic allocation of the thermal budget between cores for improved performance.

Turn-key authentication and brand protection

The counterfeit business in electronic devices continues to expand - pushing demand for robust authentication and brand protection solutions. To meet the growing counterfeit challenge, Infineon decided to take the complexity and cost out of embedded security designs for electronic devices - introducing OPTIGA Trust.

Motor control no longer needs to be inefficient, noisy or difficult

With the new Kinetis V series microcontrollers, motor control no longer needs to be inefficient, noisy or difficult. Built on the latest ARM® Cortex®-M0+ and Cortex-M4 cores, the Kinetis V series consists of multiple MCU families with scalable performance, memory and feature integration to address everything from entry level BLDC motors to advanced PMSM and ACIM motors. During this webinar you will learn about its high performance cores, analog and timing peripherals and best-in-class enablement including reference designs, software libraries and motor configuration tools.

VxWorks 7 – the real-time operating system for the Internet of Things

In this talk, Dinyar Dastoor, Vice President, Wind River takes us through an interesting journey on how the world is changing with Internet of things. In this new world, device manufacturers face new set of challenges of scalability, security and safety related applications. Apart from elaborating these challenges, he also explains how the latest generation of VxWorks 7 RTOS is designed to address these challenges. This would be also be a good watch for anyone trying to find out what is "Internet of Things" and how it affect design of device functionality.

New methods for debugging of deeply embedded multicore systems

The webtalk illustrates the new challenges for a debugger with the new multicore architectures AURIX (Infineon), Qorivva (Freescale) and SPC57x (STMicroelectronics). It describes solutions in the Universal Debug Engine from PLS for a multicore awareness of the user interface and a method for run control and synchronization. Other important topics like the observation of multiple cores during run time and functions of system level debugging like code coverage and profiling are also part of the presentation.

Big Analog Data: the big data for engineers and scientists

Engineers and scientists worldwide are acquiring vast amounts of data at very high speeds. Physics experiments can generate tens of terabytes in just a few seconds. Testing of jet engines or electric power turbines can generate similar amounts in a matter of hours. Even smart grid measurements can generate terabytes of data over the course of a month. Capturing, analyzing, and sharing this data is a "Big Analog Data*" problem.

Virtualization for embedded solutions in industrial and automation applications

This webinar discusses AMD-V technology, a set of unique on-chip features that help AMD processor-based platforms run multiple operating systems and applications on a single platform by improving the efficiency of virtualization software. AMD supports choice in the marketplace. DAS 1.0 and open standards-based management tools and technology provide the essential management features businesses need to easily and flexibly support embedded systems. AMD DAS is a term used to describe the various open standards based technologies used to help fulfill the increasing security and reliability needs of embedded solutions and includes DASH, AMD Virtualization, and Security.

Why engineers should take a 2nd look at MicroTCA

In this talk VadaTech Marketing Director Justin Moll takes a view of the MicroTCA architecture today vs. the early days, because many people have misperceptions about the architecture. The compact size, performance, and low cost of MicroTCA has made it increasingly popular for high-performance embedded computing applications in Mil/Aero, Communications, Physics, and many Industrial applications. But, many people have misperceptions about the architecture. The presentation shows the vast differences of this cutting-edge architecture from inception to today.

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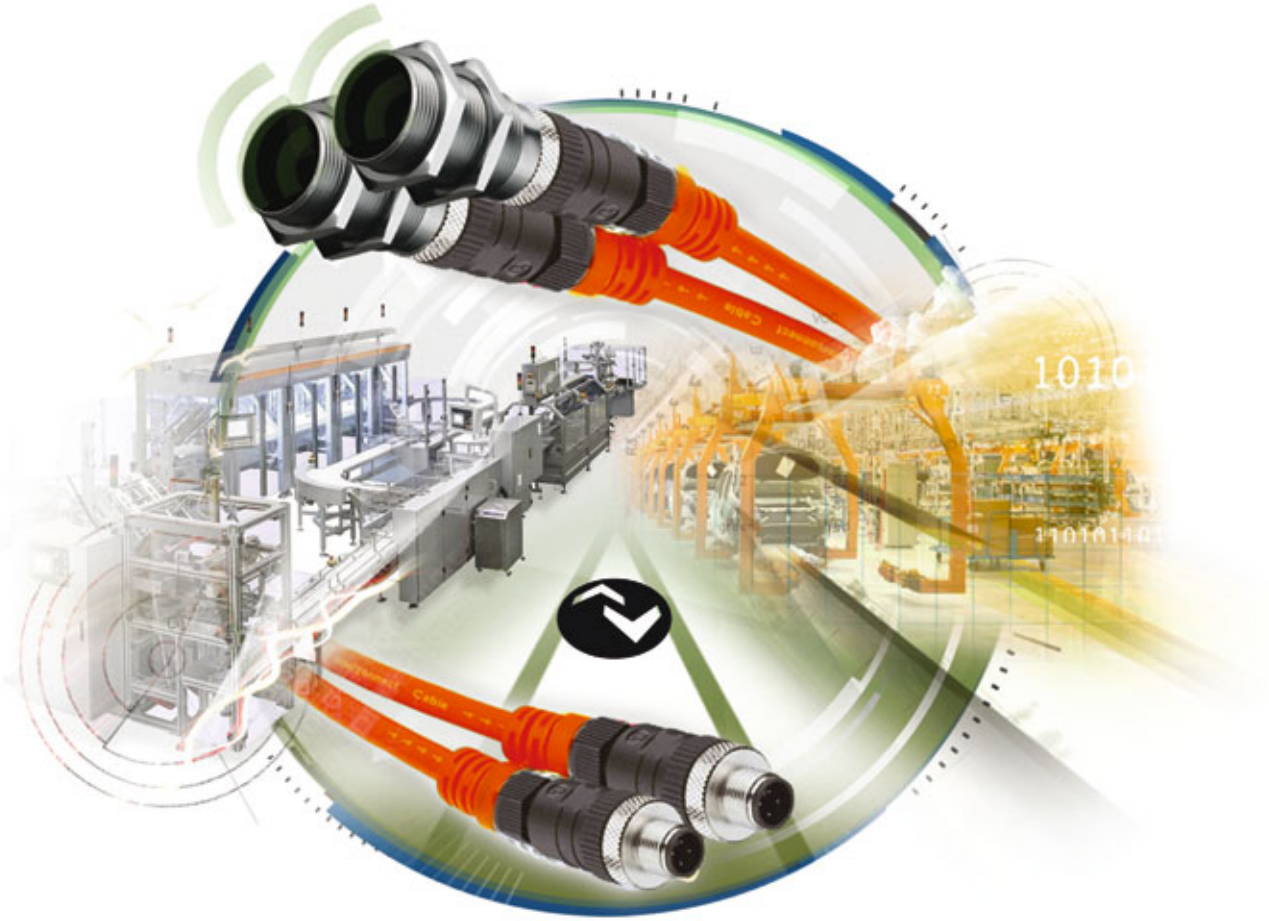

Solution key points

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