boards & solutions + ECE

Combined Print Magazine for the European Embedded Market

June 03/18

Special Features:

- IOT SECURITY
- EMBEDDED COMPUTING
- INDUSTRIAL

Cover Story:

The challenges of IoT security and how to harden the edge

ARROW

crystal clear
frequencies.

WÜRTH ELEKTRONIK

WORLD CHAMPION
FIA FORMULA E 2016/2017

#CRYSTALCLEAR

WE speed up the future

The WE-CMBNC is a VDE certified series of common mode chokes with a highly permeable **nanocrystalline core material.** Despite the small size, it delivers outstanding broadband attenuation performance, high rated currents and low DC resistance values. Low profile and high voltage ratings can also be realized by the common mode chokes of the WE-CMB family.

For further information, please visit:
www.we-online.com/we-cmb

- High permeability nanocrystalline core material
- High I_H & low R_{DC} in a small size
- Broadband suppression
- Stable inductance values at high temperatures
- Improved isolation through plastic case and patented winding spacer


Nanocrystalline
WE-CMBNC


MnZn
WE-CMB


NiZn
WE-CMB NiZn


MnZn/NiZn
WE-ExB


Horizontal
WE-CMBH


High Voltage
WE-CMB HV

Dear Readers,

There is no doubt that change is the only consitency in life. If you think about evolution than you´ll realise that change happens slowly and there is enough time for nature to adapt to these changes. But nowadays we must realise that human beings accelerate the natural change. There is global warming which threatens some parts of the world with unusual bad whether conditions. Germany was for a long time spared from these conditions but these days are gone. More and more often the news report about heavy thunderstorms, heavy rainshowers and even small hurricans in our country. This change is originated by nature but accelerated by mankind. This means that mankind hast o work together, to avoid the negative effects of global warming.

But there is another change happen at the moment and this is made by mankind alone because it is a political one. US-Presiden Donald Trump decided to start a trade war with the rest of the world "to make America great again". Initially he attached punitive tariffs to steel and aluminium from countries outside the USA. But I believe that´s only the first step and another one could follow – punitive tariffs to cars especially from Europe because here is the prime area of automobile development. This would hit the German industry hard because it depents heavily on the automobile market. A study says that 25 Percent of all jobs in Germany are depending direct or indirect on the car industry - and the Embeddded Industry is no exeption.

Beside other systems more and more embedded systems are implemented in vehicles because new safety functions like ADAS, lane departure warning, automatic brake assistant, just to name a few will be standard in future cars. And autonomic driving is also under development, prototypes are already on the streets and it will take only a short time to see the first exemplars of series-produced cars in the daily traffic. USA is one of the largest markets for European and especially German cars and the trade war could affect this important industry and the associated embedded industry as well. I hope the increase of the trade war can be avoided and rationality will dominate again in future and the embedded indstry will prosper further. There are enough technical problems to solve to create a bright future for all industries in which embedded systems work hidden in the background -it does not need additional unnecessary problems made by men.

Despite the bad news at the moment, enjoy this copy of ECE/B&S because there is hope and this is the last thing we lose.

Best regards

Wolfgang Patelay
Editor

Cover Photo:
Arrow

The challenges of IoT security and how to harden the edge 6

Securing data and devices on the IoT is essential but extremely challenging. Assets can be distributed over a large geographical area, left unattended, and subjected to all manner of attacks by devious and determined hackers. IoT security is a multi-faceted challenge. Clear frameworks and best practices, developed by security experts, can help device designers and network planners to put the right security measures in the right places

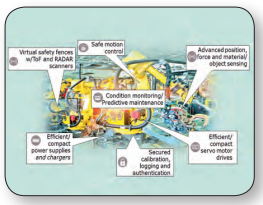
UIC-compliant IoT gateway platform opens up new possibilities 11

Today, many box PCs are marketed in the guise of an IoT gateway. However, they often lack the gateways required software support and multi-functionality. A new modular, UIC-compliant IoT gateway platform with optional real-time capable virtual machines enables OEMs to reach their goals faster.

Overcoming a major challenge with standard modular solutions 14

This article describes the complete renewal of the Moscow Metro passenger information and security system with standard modular embedded computer solutions.

Optimised semiconductors help in making robots collaborative 24



The robotics revolution has spawned a new type of industrial robot – the so-called collaborative robots. They feature advanced sensor and control components that limit power and force in order to eliminate critical collision situations entirely. Modern microcontrollers with safety functions, high-speed precision sensors as well as efficient power components enable these robots to work safely with, and not just for, humans.

Five challenges faced by Time Sensitive Networking in supporting the IIoT 27

This article highlights the contribution Time Sensitive Networking makes towards providing deterministic performance over Ethernet.

Next level of vision technology turns machines into smart partners 29

With image-based artificial intelligence, vision systems provide accurate analyses of environments and objects. The 3D technology develops with simple-to-integrate building blocks and generates a new level of perception in real time. Intelligent algorithms can make valid decisions.

The challenges of IoT security and how to harden the edge

By Andrew Bickley, Arrow Electronics

Securing data and devices on the IoT is essential but extremely challenging. Assets can be distributed over a large geographical area, left unattended, and subjected to all manner of attacks by devious and determined hackers. IoT security is a multi-faceted challenge. Clear frameworks and best practices, developed by security experts, can help device designers and network planners to put the right security measures in the right places

Security has quickly become a key concern in the world of the IoT. While digital transformation has made clear to organisations the value of data, there are also high risks surrounding the potential misuse of data. This misuse highlights the absolute necessity for strong cyber security. IoT technologies introduce numerous attack surfaces that hackers can exploit to steal data or launch other exploits. Going forward, more and more companies will be affected: Gartner predicts that over half of major new business processes and systems will incorporate some element of the IoT by 2020.

There is no doubting the power IoT applications can deliver, to help improve business efficiency and raise quality of service. Deploying huge numbers of connected sensors and actuators enables organisations to gather massive quantities of data to drive continuous improvement including: control processes remotely to streamline staffing and maximise yield, track the locations of assets to increase operational efficiency, and anticipate maintenance requirements in remote equipment to minimise downtime and utilise staff efficiently, to name just a few. As a tool to support activities like business, commerce, and environmental management, the IoT is just at the beginning of its evolutionary cycle; many more as yet unimagined applications can be expected to emerge in the future. The imagination of application developers will likely be matched only by that of hackers intent on subverting the IoT for their own ends.

Organisations will come to rely heavily on their IoT-based applications, to respond quickly to events in the field and make the right long-term business decisions. They will need a high level of trust in the data from connected assets. Hence preventing unauthorised access to this data is extremely important, to prevent eavesdropping or sabotage; if malicious agents can intercept data or gain access to connected devices, they can exploit numerous opportunities to cause damage by selling or publishing the data illegally, altering the data to misinform or misdirect, loading bogus code to take over or block the devices, or gain access to more sensitive assets within the organisation. These could be security cameras, access-control systems, drives containing confidential information, or others. If any such exploits are successful, victims may suffer direct financial losses or other harm such as reputational damage or lost market opportunities.

By their nature, IoT devices often operate autonomously for long periods, in remote locations, without being regularly inspected for signs of physical tampering. Moreover, being connected to the Internet gives online hackers the opportunity to launch attacks over the Internet without needing to go anywhere near the physical location of the device. Software that scours the Internet for vulnerable connected devices is already readily available on the Internet. Moreover, Gartner – in the same report that predicts the future pervasiveness of the IoT – has said there will be a $5 billion black market by 2020 for fake sensor and video data that can be used to compromise the integrity of data from legitimate IoT devices.

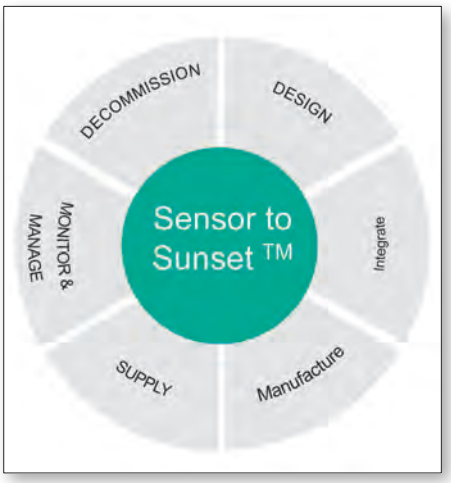


Figure 1. Security concerns over product lifecycle

Compliance Class	Description	Security Objective		
		Integrity	Availability	Confidentiality
Class 0	Compromise to the data generated or level of control provided is likely to result in little discernible impact on an individual or organisation.	Basic	Basic	Basic
Class 1	Compromise to the data generated or level of control provided is likely to result in only limited impact on an individual or organisation	Medium	Medium	Basic
Class 2	In addition to class 1, the device resists attacks on availability that would have significant impact an individual or organisation, or impact many individuals, for example by limiting operations of an infrastructure to which it is connected	Medium	High	Medium
Class 3	In addition to class 2, the device is designed to protect sensitive data including sensitive personal data	Medium	High	Medium
Class 4	In addition to class 3, where the data generated or level of control provided or if a security breach occurs have the potential to affect critical infrastructure or cause personal injury.	High	High	High

Table 1. IoT Security Foundation compliance framework for IoT end nodes

Figure 2. Security strategy for edge-node designs

Clearly, the threat is real and significant, and organisations understand the key areas of vulnerability that present barriers to adoption of IoT-based business solutions. Businesses surveyed by 451 Research expressed concern about weaknesses throughout the IoT infrastructure, particularly at the network edge including IoT endpoints and their connections to other devices and the central network.

The most important concerns are the physical security of endpoints, authentication of connected devices, the security of application software, and the connections between IoT devices and the central network. Issues like the security of IoT data stores and vulnerability to denial of service attacks rank below the challenges related to the more vulnerable edge devices and infrastructure. Securing assets connected to the IoT is a huge challenge. Devices are not only vulnerable to physical attacks as well as online exploits, but also typically have only limited resources like processor cycles, power, and memory, to support electronic security. Suitable security must also be unobtrusive, so as not to obstruct authorised users or detract from the overall efficiency and business value of the application. To help implement adequate security, within the prevailing constraints, it is valuable to analyse the potential threats facing various types of device, and the possible implications of a breach in each case, and so develop coherent security policies and best practice guidelines.

The IoT Security Foundation has comprehensively studied device and data security breaches, and their impact on privacy, business activity, infrastructure and safety, to formulate a set of security compliance classes. This analysis can help ensure that IoT devices are designed with adequate security for their intended use and deployed appropriately by network planners. Table 1 describes these compliance classes, in relation to device integrity, device availability, and data confidentiality.

Any approach to IoT security must also recognise that hackers will seek to target the weakest links in the network and use the smallest and lowest-cost nodes as entry points or stepping stones to reach higher-value assets and/or penetrate core networks. A structured approach is needed when designing IoT devices, and when setting up networks, to ensure that all available security techniques are assessed and implemented according to need and within the capabilities of the host system. Security measures applicable to IoT devices include: tamper detection, secure data storage, securing data transmission, authentication, secure boot, secure firmware updates, secure manufacturing of IoT devices, secure decommissioning of IoT end nodes and proper handling of associated assets (data), and security policies and procedures.

These considerations span the complete IoT-device lifecycle (figure 1), from the earliest stages of designing the embedded system – such as selecting a microcontroller with integrated cryptographic coprocessing, or a discrete hardware secure element – through manufacture, commissioning and maintaining while in the field, to removal from the network and disposal at end of life. Even with the aid of a rigorous compliance framework such as that developed by the IoT Security Foundation, and a clear grasp of applicable hardware and software-based security techniques, the fact remains: IoT data faces a huge diversity of security challenges between network endpoints and the core, whether this is a private corporate network, or the Cloud. A wide range of security solutions is available, from many providers, but developers need help to evaluate, select, and combine the chosen elements into a coherent whole that covers all potential vulnerabilities optimally. Figure 2 suggests a security strategy for IoT-endpoint designs, to protect against physical and online attacks.

The Arrow Connect offering aims to provide such a resource, by bringing together solutions for managing IoT devices including endpoints and gateways. It encompasses both a Software Development Kit (SDK) for gateways and endpoints, and the design of device to Cloud management. It includes solutions for provisioning devices on the network securely, authentication, handling security keys, device identification, device management, endpoint priorities, groupings and hierarchies, data ingestion, data storage, data access, and Over-The-Air (OTA) software update. ■

Establishing a Chain-of-Trust for secure device manufacturing

By Rajeev Gulati, Data I/O

The challenges of a secure manufacturing solution should not be understated. Secure devices must be able to be provided anywhere in the world with OEM private keys and product software protection. Major semiconductor suppliers and programming centers need to ensure their secure elements and microcontrollers are designed according to rigorous security standards, and to establish and maintain Chains-of-Trust.

As digital devices become ubiquitous at home and at work, and as humans become dependent on these devices to help organize more of their lives, the security of these devices becomes an increasingly important area of concern. Conservative market analysts estimate there will be 20 billion connected devices in the Internet of Things (IoT) by 2020. Security experts agree the best way to ensure better Internet of Things security is to integrate security features and embed Roots-of-Trust (RoT) early in the design and manufacturing stage, often referred to as security by design. It is essential to establish a Chain-of-Trust from the hardware through software and into final products. This involves starting with a secure MCU or secure element with a Roots-of-Trust then creating an environment to authenticate that device and its firmware. This Roots-of-Trust then needs to be transferable to any manufacturing environment with minimal process changes. The end result is a trusted device that will operate as intended and can be authenticated by the rightful owner.

Before we delve deeper into issues that impact security in manufacturing, it is helpful to first understand the digital device manufacturing process. Digital devices (e.g. mobile phones, smart thermostats, routers, smart watches, smart light bulbs etc) are generally manufactured by Original Equipment Manufacturers (OEMs). OEMs use component ICs (e.g. MPU, MCU, memory chips, storage chips, modem chips, configurable logic chips etc) to develop the hardware of a digital device. These component ICs are procured by OEMs from silicon vendors, who develop and manufacture them prior to their use in smart devices. OEMs design not only the hardware of the smart device, but also design and develop the embedded firmware that runs inside the device and makes it smart.

Silicon vendors generally design their component ICs at their own development labs. In order to manufacture their ICs some silicon vendors set up their own fabrication factory. Others rely on third parties to fabricate their silicon for them. To get their devices to market, silicon vendors either sell their ICs directly to OEMs or use IC distribution partners to sell their components. Like silicon vendors, most OEMs design the hardware and firmware of their digital device at their own development laboratories. Based on factors that impact quality, cost and time to market, OEMs have multiple choices when it comes to manufacturing. The manufacture of an OEM device involves at least three steps: assembly of the multiple ICs of the device on to a pre-designed and fabricated printed circuit board (PCB), programming of the firmware into the storage component IC of the digital device, and testing the hardware and the firmware of the manufactured device to ensure that they work together as designed. OEMs can choose to do all the three steps at their own factory. Alternatively, OEMs can have the programming of firmware into ICs done at an IC vendor's distribution partner prior to shipping programmed components to a contract manufacturer for assembly and testing. As a third alternative, all three steps can be done at the same contract manufacturer. From the review of the IC manufacturing process and the digital device manufacturing process described, it is clear that the device manufacturing supply chain is distributed worldwide and the process can include multiple stakeholders aside from the OEM.

The *first critical issue in manufacturing related to security* is that, given that the supply chain of ICs is global and the device manufacturing process can be distributed across multiple entities in multiple geographies, *the supply chain OEMs use to build their smart devices is today insecure.* There are many factors that lead to the insecurity of the supply chain. The first is that a large number of IC components manufactured by silicon vendors lack a unique digital identity that can be verified by OEMs as part of the manufacturing process. Another is that where IC identity exists,

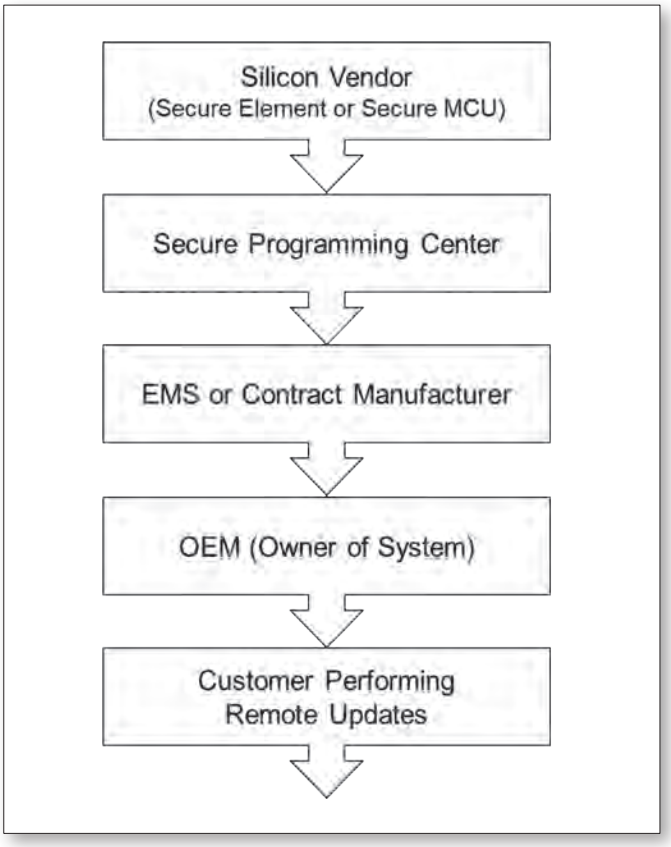


Figure 1. Chain-of-Trust: Secure supply chain

OEMs have not incorporated an IC verification process to validate the authenticity of the component ICs. This could be because a verification process has not been developed, or such a process exists but is not scalable to high volume manufacturing because its integration into manufacturing adversely impacts cost or time to market, or both.

Lack of security in the supply chain of components is not limited to the silicon IC. Boot loader and firmware that is developed by an OEM is important intellectual property (IP) that also needs to have a digital identity. This IP also needs to be protected (from changes or loss) while in transit from the point of creation (OEM development laboratory) to the point of programming (OEM factory, programming center, contract manufacturer). The device manufacturing processes that are deployed today are weak and do not ensure such outcomes. Another insecurity factor comes into play when an OEM decides to outsource manufacturing to a third party: since third party manufacturing is done at a remote geographical location, OEMs have no secure process to manage production counts of their devices at the manufacturing site. These OEM have to implicitly trust their third party manufacturing partners to build the correct number of devices. Unfortunately, this trust is broken more often than not, leading to overproduction of devices.

The impact of an insecure supply chain on an OEM is extremely high. Lack of a verifiable component identity leads to the use of counterfeit components in devices. If this happens, these devices may be of poorer quality and may not be functional equivalents to devices made from genuine OEM authorized components. Lack of IP protection can lead to manufacture of duplicate devices by alternate OEMs with the same features and functionality as the original device. Use of counterfeit components, overproduction of devices and duplication of devices lead to lower ASP, lower revenue, higher warranty and support costs and lower profitability for the OEM. Lack of security in the supply chain costs OEMs lost revenue to the tune of hundreds of

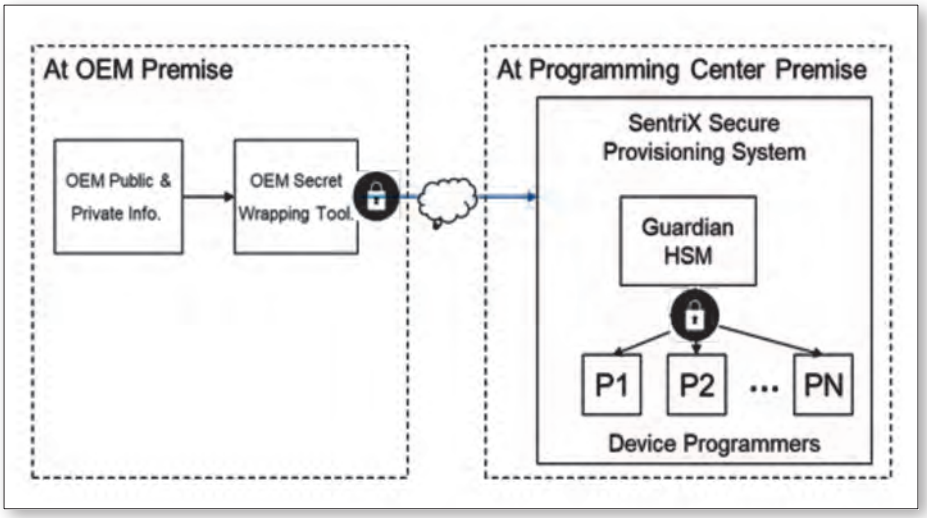


Figure 2. Secure provisioning system architecture

millions of dollars. Figure 1 shows the example of a secure supply chain. The *second critical issue in manufacturing related to security* has to do with the *OEM's ability to manufacture trusted devices*. A trusted device is one which has a unique and verifiable system level identity, and can store and execute firmware in a tamper-free environment. Some devices have additional security requirements to be able to communicate securely with other devices or systems.

The first factor that impacts an OEM's ability to build trusted devices is the choice of components that the OEM makes. Trusted devices need to have security functionality designed in - ability to securely generate keys, ability to execute encryption in a secure environment, ability to store firmware in protected storage, and ability to run firmware in a protected environment. If the OEM does not embrace security by design paradigm and ignores security requirements, it is likely the device will be built with the wrong components. This is indeed the case today, as a number of OEMs are ignoring security as a primary device requirement. The second factor impacting OEM ability to manufacture trusted devices is the availability, maturity and cost of additional technology and processes that need to be integrated into the manufacturing process. Embedding security into devices requires the secure flow of important OEM key material and Roots of Trust from an OEM facility to where devices are manufactured. These methods have yet to be developed and integrated into the device manufacturing process. Embedding security into devices also requires advancements in programming technology so that security credentials for devices can be generated and programmed in addition to programming of firmware. Such technology is yet to be designed and integrated into existing high-volume manufacturing processes. Protecting firmware on a device also requires extending the programming cycle on the device to first secure the device and then to program encrypted firmware on the device. This change in programming flow requires development of new device algorithms that secure the device and firmware on the device and lock the device out.

Some OEMs use in system programming (ISP) a method to embed security and firmware into devices. Such a process is done late in the device manufacturing cycle, after components are placed on the device PCB. From a security perspective, this approach works if the OEM is manufacturing devices in its own factory. However, if the OEM is using third parties for manufacturing, the OEM would have no cost-effective method to verify if all the devices have been built using authentic components. In addition, the phases of manufacturing prior to ISP programming will remain vulnerable to tampering attacks. Devices need to be preprogrammed or provisioned, and the most secure way to accomplish this is at the semiconductor supplier factory or via secure preprogramming equipment. Data I/O is the leader in secure programming and has built a 45-year reputation around trustworthy data programming. The new Sentrix provisioning and programming offers best-in-class security to the individual device secure programming market. ■

Product News

■ Wibu-Systems: CodeMeter provides secure storage for SGX native enclaves

Wibu-Systems has successfully completed the Intel Software Guard Extensions (Intel SGX) enablement process for CodeMeter on Windows platforms. CodeMeter is a technology that is laser-focused on the automatic or manual protection of software, firmware and data. It combines the latest hacker-proof encryption methods with secure hardware, software, or cloud elements where encryption keys as well as license and entitlement rights are safely stored.

News ID 6122

■ IAR: Visual State Version 9.1 with updated design and code generation tool

IAR Systems has launched version 9.1 of the graphical modeling tool IAR Visual State. The new version further speeds up and simplifies development when working in teams. The design and code generation tool IAR Visual State helps developers bring order to their designs and speed up their projects. It is used to graphically design state machines and generate C/C++ source code. With IAR Visual State, developers can speed up time to prototype and shorten time to market.

News ID 6299

■ Express Logic supports Cypherbridge secure boot and secure firmware update solution

Express Logic announced the integration of the Cypherbridge Systems uLoadXL secure boot and safe software update solution with its X-Ware IoT Platform. The X-Ware uLoadXL secure boot and secure firmware update solution anchors the product root of trust, authenticating and integrity checking the X-Ware-based system application. Managed software updates are securely distributed and installed on the target product.

News ID 6273

■ Green Hills: Compiler 2018.1 adds C++14 and meets highest levels of functional safety

Green Hills Software announced the availability of its Compiler 2018.1 for creating highly optimized 32-bit and 64-bit embedded C and C++ software applications for all leading embedded processor architectures, including Arm, Intel and Power Architecture.

News ID 6095

■ Conrad introduces new digital storage oscilloscopes from Voltcraft

Conrad Business Supplies expands its extensive range of test and measurement solutions with the DSO-1000 digital storage oscilloscopes from Voltcraft. The new 4-channel oscilloscopes offer enhanced functionality and are perfectly suited for test and measurement in R&D, laboratories and schools, as well as for maintenance, repair and overhaul.

News ID 6285

UIC-compliant IoT gateway platform opens up new possibilities

By Zeljko Loncaric and Johannes Greulich, congatec

Today, many box PCs are marketed in the guise of an IoT gateway. However, they often lack the gateways required software support and multi-functionality. A new modular, UIC-compliant IoT gateway platform with optional real-time capable virtual machines enables OEMs to reach their goals faster.

Figure 1. The fanless conga-IoT2 gateway platform with up to 8 antennas has an aluminum die-cast housing, which offers ultimate stability and cooling for use in harsh environments and is appropriately shielded for use with multiple radio protocols.

■ The most important task of IoT gateways is to access and process the data in the field in order to make decisions locally and to inform central management clouds as well as neighboring systems about important system states or processes. The same applies to digital signage installations, emobility charging stations, ticket and vending machines, as well as public video surveillance systems and many other complex IoT installations.

The challenge lies in the required flexibility of the logic to be installed. This stems from the diversified installed base with multiple heterogeneous communication channels from the devices to the IoT gateway, and numerous communication options from the gateway towards the clouds or other gateways. Even if considering only the options provided by low power wide area networks (LPWANs), basically all relevant protocols need to be supported: NB-IoT, Sigfox and LoRa, as well as GSM/LTE and, in future, the upcoming 5G. For instance, if a company sets up a local LoRa network to manage parking areas, it is quite possible that the operator wants a GSM/LTE interface to connect to the central cloud, backed up by a Sigfox interface for the event of a power failure or overload. Another alternative is a combination of LoRa and NB-IoT where GSM/LTE is used only for data-intensive system maintenance tasks and upgrades.

When adding radio technologies that span much smaller areas than LPWAN and GSM/LTE to the picture, additional standards come into pla. For instance, if Ethernet cabling for e-charging stations is too costly because of the necessary roadworks and earthworks, ZigBee interfaces must be used to provide fast peer-to-peer network communication between thousands of interconnected devices. WLAN would be far too complex and, depending on the number of WLAN nodes to be passed, also too slow. The list goes on with countless other radio solutions, including Wireless M-Bus for remote meter reading, wireless LonWorks and RF for KNX networks for facility management, or even Z-Wave and Bluetooth/BLE for home automation.

Next, there are the requirements for connecting wired logic. Starting with digital and analog I/Os via serial interfaces and fieldbuses, they go on to include Industrial Ethernet protocols such as EtherCAT, Profibus, Modbus TCP, POWERLINK, Sercos III and CC-Link IE, or even solutions such as CANopen over EtherCAT. Not to forget real-time Ethernet in compliance with the Time Sensitive Network (TSN) protocol according to IEEE 802.1, as well as numerous proprietary service interfaces to existing equipment. All this and much more can be found in the real, not yet IoT-connected world. And to develop new services and increase efficiency, all this must be connected now. Sometimes, there is also a need for fast camera interfaces, such as MIPI CSI-2 for smart camera applications, to integrate situational awareness solutions.

As of yet, there is no ready-to-use system that provides all these functions off-the-shelf. However, recognizing this need, manufacturers like congatec have developed a universally deployable IoT gateway platform that is extremely modular and can be tailored to the specific functional requirements of an OEM. With an aluminum die-cast housing that provides the best in stability and cooling for harsh environments, the platform comes with many features that OEMs can use immediately. Notably, the system offers up to 8 antenna plugs (4x SMA and 4x RP-SMA) and 6x miniPCIe, 1x M.2 and 2x USB 2.0 slots for flexible wireless and wired interface support. OEMs benefit from an IoT gateway platform that can easily connect a wide mix of devices, is pre-certified for a variety of applications, and suitable for the extended temperature range.

OEM-specific customizations of the completely fanless gateway can be carried out in various forms. The spectrum ranges from individual branding of the housing, swapping USB for PCIe slots, or omitting certain functions, to fully customized system designs.

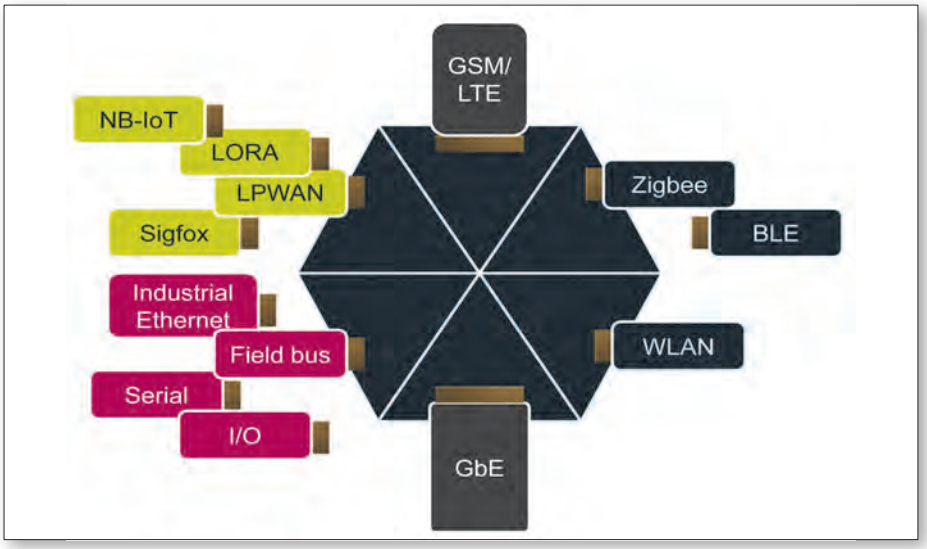


Figure 2. The conga-IoT2 platform for OEM gateways supports a wide range of miniPCIe, M.2 and USB 2.0 based interfaces off-the-shelf.

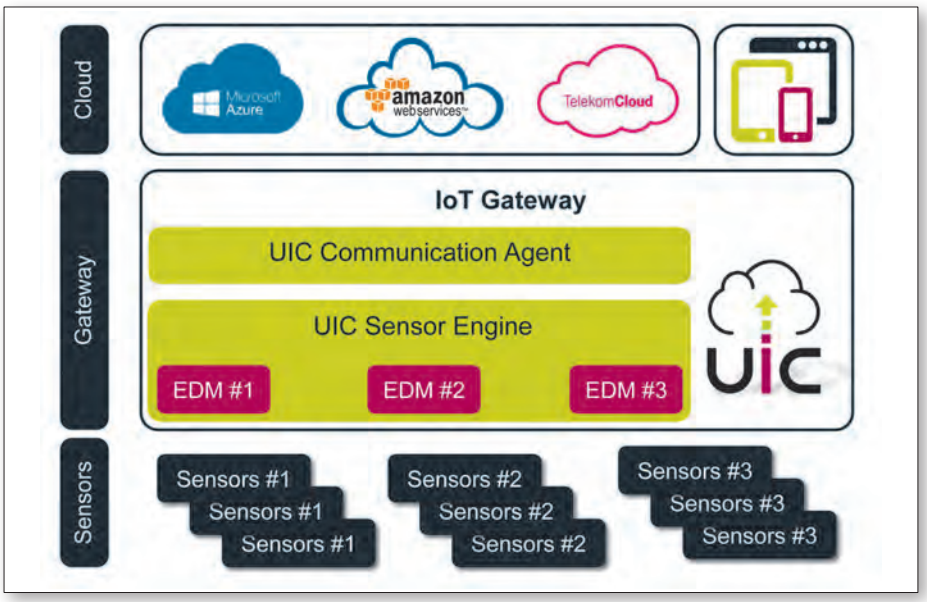


Figure 3. The IoT platform supports SGeT Universal IoT Connector (UIC). It extends the eAPI with Embedded Driver Modules (EDMs) to introduce a generic driver model.

From the moment of first evaluation, OEMs get a platform that is pre-configured and pre-certified for a variety of tasks, which saves design-in costs and speeds time-to-market. For example, different modules were pre-tested in different configurations for WiFi, 3G/LTE, LoRA, Zigbee, Sigfox, NB-IoT and BLE in the conga-IoT2 gateway. In addition, the system design was appropriately shielded for use with different radio protocols and subjected to extensive testing to effectively eliminate interference.

This means the key conditions for using heterogeneous radio technologies in a single system have already been taken into account in this platform design. In addition, the conga-IoT2 gateway also supports the Universal IoT Connector (UIC) software standard that the SGeT introduced at embedded world 2018 and for which proprietary congatec Cloud API for IoT gateways provided an essential template. The UIC is an important milestone in embedded computing as it enables any embedded hardware that has been developed in accordance with eAPI to exchange data between embedded devices and a cloud-hosted infrastructure using MQTT or XRCE. This is a truly universal approach with the advantage that the many proprietary IoT offerings can now be standardized. The UIC is based on two main pillars: the Embedded Driver Modules (EDMs) for hardware identification, security and device mapping; and a communication agent to handle and decouple communication. This will make it possible to connect the conga-IoT2 gateway and its associated peripheral networks with the more than 500 cloud services that are available worldwide. The UIC architecture defines key components to overcome the barrier presented by proprietary implementations of sensor data collection, and to publish and visualize the data securely in a cloud server infrastructure.

The UIC standard realizes this in two steps, the first of which is to cover hardware support. For this purpose, the eAPI is expanded with EDMs to provide an IoT-enabled hardware API. The EDMs introduce a generic driver model to neatly integrate aspects not covered in the eAPI. The second step is the creation of a communication agent to connect to different cloud services such as Microsoft Azure, Amazon Web Services, SAP Hana and many more, as well as the authentication of devices in a cloud application.

Future steps are aimed at complementing the existing software to increase the number of available functions. Improvements in data security and authentication are further steps that are made possible by the UIC standard. Adhering to the principles of interoperability and interchangeability, as well as scalability, makes the UIC architecture a very lean, versatile and open approach that helps to enable new technologies while minimizing the risk of investing in the wrong technology.

In cooperation with Real-Time Systems GmbH, the offering for the new conga-IoT2 platform will be expanded to further simplify the use of embedded computing technology even under the very demanding conditions of a universally deployable IoT gateway. The UIC that connects the eAPI to the hardware as well as each connected wireless network and other peripherals can be made available in virtual machines. This makes such installations relatively simple to encapsulate and port to other hardware platforms.

Currently, the conga-IoT2 platform can be equipped with the high-performance conga-QA5 Qseven modules based on the low-power Intel Atom, Celeron and Pentium processors (codename Apollo Lake/5W to 12W), which makes the platform very powerful and highly scalable. Up to four cores can host up to four virtual machines. Even more powerful designs based on COM Express modules with up to 16 cores can also be supported. The modules for the extended temperature range from -40°C to +85°C support the IEEE 1588-compliant Precision Time Protocol, which can deliver highly accurate synchronizations. All modules support Microsoft Windows 10, including the Microsoft Windows 10 IoT versions, as well as current Linux operating systems and work directly with the RTS hypervisor from Real-Time Systems. ■

Product News

AAEON updates intelligent vending development kit

AAEON releases an updated version of its Intelligent Vending Development Kit. The kit is a complete hardware solution that makes it easier than ever before for retailers to implement the latest smart vending technologies. The kit includes a vending machine controller unit, a separate UP Board PC unit to handle the interactive retail functions, a motor for the machine's internal mechanisms, a camera, a QR Code device, and all the cables needed to connect these components.

News ID 6216

Advantech: co-creation strategy to support IIoT deployment in Europe

Advantech European new growth strategy targets revenues of €350m by 2025; the company will accelerate deployment as it celebrates its 25th year in Europe. A new model of co-creating with various domain fields' partners will also help deliver the Industrial IoT ecosystem, culminating with an IoT Co-Creation Summit scheduled for November 2018.

News ID 6304

Axiomtek: slim-lightweight, EN 60601-1 certified 10.1" medical touch Panel PC

Axiomtek introduce the 10.1-inch EN 60601-1 certified panel PC for medical applications, the MPC103-845. This super slim medical touch panel computer is powered by the Intel Celeron processor N3060 with a fanless and noiseless design. The all-in-one structure with multi-touch screen minimizes peripherals and wiring. This medical PC adopts a 10.1-inch WXGA TFT LCD display with a projected capacitive touch screen and 350 nits of brightness.

News ID 6306

congatec: COM Express Computer-on-Modules with 8th gen Intel Xeon and Intel Core processors

congatec introduces its brand-new conga-TS370 COM Express Type 6 Computer-on-Modules in parallel with the launch of the 8th Generation Embedded Intel Xeon and Intel Core processors (codename Coffee Lake H). They propel the 35-45 W TDP class of COM Express Type 6 modules to a new 'six-pack' level of high-end embedded computing, offering for the first time up to 6 cores, 12 threads and an impressive turbo boost of up to 4.4 GHz and drive up to three independent 4k UHD displays. Initial tests from congatec indicate that these brand new six-core modules offer between 45 to 50 percent more multi-thread and 15 to 25 percent more single-thread performance, compared to 7th Gen Intel Core processor based variants.

News ID 6166

Kontron: rugged, fanless, IP67, gateway computing platform for in-vehicle applications

Kontron introduced the EvoTRAC G103 In-Vehicle Rugged Cellular and WiFi Gateway that delivers broad connectivity capabilities that enable a new range of in-vehicle management, remote access and cloud-based applications. Providing the mobile connectivity and onboard recording device storage needed for a new generation of more intelligent systems, the EvoTRAC G103 features a WiFi and 4G Advanced Pro+ LTE module, and includes 64GB eMMC for onboard storage as well as optional fixed storage capacity.

News ID 6312

Overcoming a major challenge with standard modular solutions

By Alessandro Santini, SECO

This article describes the complete renewal of the Moscow Metro passenger information and security system with standard modular embedded computer solutions.

There were major challenges to overcome: the customer needed to renew the on-board sensors as well as the video surveillance and digital signage devices of the Moscow Metro System at short notice. As a matter of paramount importance, the new devices needed to guarantee over 10 years of operation and more than 30 years of maintainability. The solution to be adopted needed to combine low power consumption and high-performance graphics in a small, modular scale platform. All of this while complying with railway regulations which require modules to be reliable even in the harshest environments, i.e. with a temperature range of -40/+85°C.

The question was: how best to renovate the Moscow underground in a timely manner while ensuring full compliance with current regulations in terms of safety and long-term reliability of the deployed solutions? This has been the challenge undertaken by SECO since Q3 2016. Global restructuring with regard to IT technology involving not only the onboard sensors but also the video surveillance system, the emergency communication service, the digital signage devices and the data traffic between the wagons and the front section in the Moscow Metro. A leading company in the development, production and integration of electronic systems specializing in Metro systems and railways was instructed to restore the electronic and digital equipment for the Moscow underground. The customer, located in the Russian Federation, was highly experienced with regard to the railway digital communication system but needed a trustworthy third party with solid expertise in embedded hardware to design, prototype, mass produce and implement a suitable scale solution. The project was extremely complex and entailed a multitude of challenges to overcome.

First and foremost, meeting industrial quality standards while ensuring a rapid time to market. Quality refers to two aspects in this context: performance and power consumption on the one hand, security and longevity on the other. With regard to the former, the envisaged solution needed to achieve an optimal performance/power consumption ratio - in other words, superior capabilities graphically and at the same time low power consumption. Of crucial importance, furthermore, are the durability, maintainability and reliability of the entire system. As an essential condition, the new devices needed to guarantee 10+ years of operation and 30+ years of maintainability. Last but not least, the system needed to work within a broad range of environments as required by the EU regulatory requirements, that is to say, everything needed to be perfectly functioning within a temperature range of -40/+85° C.

In terms of time to market, with this point being extremely important, it was a critical factor to take into account the fact that the Moscow Metro is a major artery of the city network, serving millions of people every day. Consequently, at no stage could the renewal interfere with the daily activity of its users. Of course, cost effectiveness also played a decisive role as the smallest of increases would result in a significant scale difference. Bottom

Figure 1. The solution needed to achieve superior capabilities graphically and at the same time low power consumption.

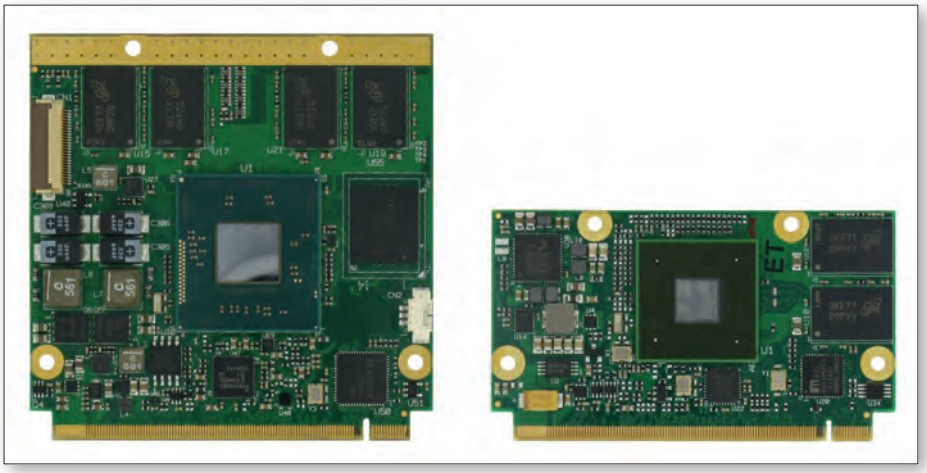


Figure 2. Both the ARM and X86 Qseven modules complying with railway regulations could be delivered immediately in volume.

line: from the initial design to the final implementation the renovation needed to be very rapid yet precise in every detail. To fulfill these requirements SECO worked closely with the customer from the beginning, analyzing the context, assessing all the issues and gathering feedback from the development phase to the fine-tuning. Close collaboration with clients is fundamental in order to succeed. Understanding the framework in which SECO has to operate is essential and it is only by paying the utmost attention to the demands and feedback of the customer that it is possible to achieve the goal. SECO does not come to the table with a pre-planned solution in mind. On the contrary, it places great importance on listening to the customer as well as analyzing the problem and exchanging our know-how with the commissioner. The customer is indeed the most valuable resource.

At the end of the analysis phase SECO had devised an ARM/x86 standard modular solution, the only one ticking all the boxes. Regarding the performance/consumption ratio, such a platform ensures good graphics performance and high energy efficiency, while also being optimal in terms of cost effectiveness. Additionally, a standard module represents the best fit in relation to scalability. Once the platform was defined, SECO, together with the customer, chose the set of modules to be deployed, namely the ARM and x86 Qseven and µQseven standard modules. Regarding the x86 modules, SECO opted for the Q7-A36, a Qseven based on the Intel Atom E3800 and Celeron families (SoC) (former code name Bay Trail) as being a cost-effective and mobile-oriented module with eMMC and camera interface as well as featuring industrial-grade components (temperature range -40/+85°C). The ARM solution was instead the µQ7-962, a µQseven module based on the ARM Cortex-A9 i.MX6 SoC, unique given its optimal balance of performance and size. Interestingly, the µQ7-962 is a flexible solution, perfect for high-end, multi-display scenarios, also available in the industrial temperature range, and is available in two versions: the high-performance one, with Quad Core CPU, and the more cost-effective Solo Core solution. Finally, in order to be regulation-compliant, modules were produced with PCB ISOLA PCL370HR and compliant Novec 3M EGC-1700 coating.

SECO was uniquely positioned to address all these mentioned issues. Firstly it was able to quickly supply both the ARM and X86Qseven modules complying with railway regulations, which means a significantly rapid time to market and ultimately an improved ROI. Not only that: SECO boasts a formidably vast range of modules for different purposes and this, in combination with its customer-first culture, offers a huge choice of options to the client. Most importantly, since 1979 SECO has operated on a global scale in the field of embedded electronics, collaborating with world-class enterprises, institutions and research groups all over the world. It is one of the benchmark companies worldwide in the field of embedded hardware and its reliability is unrivalled. ■

Product News

■ acceed: fanless IPC with space for 4 PCI/PCIe cards

With up to four slots for PCI or PCIe cards, the new industry PC series MVP-60xx is a high-performance and cost-efficient solution for all areas of industrial manufacturing, machine vision and automation. The plug-in cards (1 x PCIe x16 and 3 x PCI or 2 x PCIe x16 and 2 x PCI) in the compact casing, which are accessible from the front, enable application-specific extensions of the function, for example for drive controls, visual quality control or further specific tasks.

News ID 6197

Defining IoT and Industry 4.0 with embedded systems

By Konrad Zöpf, TQ-Systems

Embedded systems play a vital role in both characterizing and developing the Internet of Things as well as in creating new processes in automation. They address several requirements of IoT solutions and thus enable highly project-specific solutions.

(Source: istockphoto/a-image)

■ Today, the age of the steam engine can be considered Industry 1.0 because this invention ushered in the first industrial revolution. That was pretty much the breakthrough on the road toward automation. This was followed by the introduction of conveyor belt production, considered another milestone for the rational and effective production of goods and thus Industry 2.0. In Industry 3.0, programmable logic controllers - called PLCs - made their arrival in this new age. The fixed wired control processes that were usually used via a relay system up to that time became a thing of the past.

The age of hardware and software began, thereby laying the foundation for embedded systems. The effort required for wiring was reduced and this new kind of control system had more and more flexibility. Initially, embedded systems were based on 8 or 16-bit microcontrollers. In this automation phase, so-called field busses were used for the first time along with the connection of sensors such as optical barriers, limit switches, temperature and level sensors. Smaller, decentralized controllers were connected with PLCs via field busses and proprietary networks. The demands made on networking and data supply grew continuously. Thus, the requirements for bus systems and networks also increased in order to display data on completion statuses, inventories, production capacities etc. This is achieved by linking the machines to a company administration computer (vertical integration). This is referred to as a networked factory.

A new age of automation also began when networking became commonplace: Today we speak about Industry 4.0 and IoT. Both are neither a product nor a concept. Rather, it is a vision of the total networking of intelligent digital systems. In the future, machines should be able to control each other through new information and communication techniques. Production processes such as production itself, planning and service should be automatically optimized. The entire process should occur in real time as much as possible in order to achieve a self-organizing production system or added value chain.

In order to implement this project in reality, all the data required for this purpose must be available. If this could be considered on a global level, there would not be enough energy as well as memory capacity to save all data in a cloud. Thus, logical system concepts are the prerequisite for the implementation of this vision. Important requirements for this are the localization and networking of all systems as well as the use of energy-efficient systems and the transfer of required information instead of complex and large data volumes. Another important point is a sufficient security concept when networking machines, systems and devices and transferring and networking safety-critical information. No one wants critical information and data to be made available to the public or even competitors through global hackers, security gaps or inadequate protection.

Companies face numerous tasks which require a solution according to the project-specific requirements. Possible approaches to a resolution are embedded modules and system solutions. The manufacturers of ARM-based CPUs often offer sound system and security concepts. In addition to the hardware-based security functions integrated in the CPU, there are already many software solutions to implement secure and reliable systems.

Particularly ARM-based embedded systems are an ideal platform to implement projects in terms of the requirements of IoT and Industry 4.0 regarding energy efficiency. ARM has the highest performance per chip surface and is a leader in chip technology when compared to the other architectures. ARM-based CPUs of several manufacturers are currently undergoing rapid developments: in terms of performance, along with the current computing cores with a 32-bit architecture such as

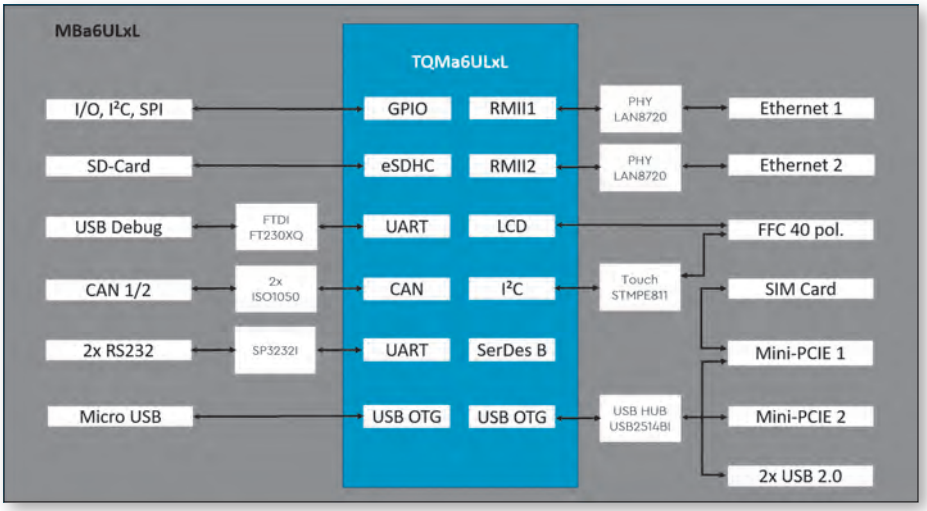


Figure 1. Example of an IoT gateway, expandable with WiFi, UMTS and LoRaWan

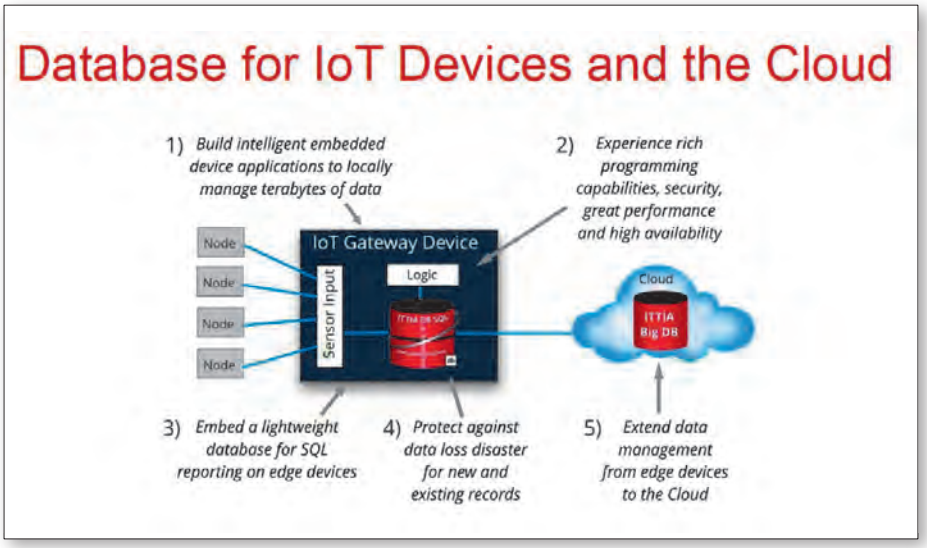


Figure 2. Database for IoT devices and the Cloud (Source: ITTIA)

Cortex A7, Cortex A8 and Cortex A9, ARM also offers computing cores that are based on a 64-bit architecture, such as Cortex A53 or Cortex A72. They continue to show a very good relationship between computing power and power loss despite the increasing performance.

The ARM chip manufacturers use this advantage and integrate the corresponding application-specific interfaces for every market in order to keep up with the new market demands, particularly in the networking area, while taking the highest security standards into account. A cost-efficient and function-optimized alternative based on different ARM computing cores is available for almost all industries, whether for the automobile industry, the networking area, automation or control engineering. It also sets itself apart in that, in the future, other security functions can be integrated to meet the market demands even better in terms of secure data transfer. More and more wireless networks are gaining significance in the data transfer area: in addition to Wi-Fi and Zigbee, another emerging trend in the industry is known as LoRaWan (Long Range Wide Area Network), which is gaining acceptance.

The advantage of LoRaWan is that a range can be achieved for greater distances (for cities around 15km, up to 40km for rural areas). Another major advantage is the usage within buildings because good infiltration is achieved due to the frequency range. Also, the power consumed by LoRaWan end devices is around 10mA in operation and approximately 100nA in idle mode. This also allows use in battery-operated devices. Communication between the end devices and the gateways occurs on different frequency channels with different data rates that are between 0.3 Kbit/s and 50 Kbit/s. Those are exactly the features in the IoT area that make wireless networking easier and more cost-effective. The connection of a LoRaWan module can also occur via USB.

Many interfaces such as graphics, Ethernet, CAN, ADCs, I²C, SPI and digital IOs are already integrated into the CPUs in the ARM-based microcontrollers from various manufacturers. Due to the versatility of the interfaces, most system requirements to connect suitable sensors and systems for data recording can be implemented without major additional effort. ARM-based processors can be used universally due to the interface versatility and the ability to freely choose an operating system. More and more devices are developed based on this architecture, prompted by good application support by the MCU manufacturers for different market segments.

Adapted operating systems are used for the ARM MCUs especially for operating systems adapted to this processor type. Depending on the project requirements, a corresponding OS such as Linux, QNX, VxWorks or a real-time OS by Green Hills or Bare Metal can be selected. This has the advantage that the user is provided with optimum performance. Thus, also complex control systems can be achieved in the automation area, even with very appealing graphics performance, that can do without the large overhead of an operating system.

The TQ embedded specialists have taken advantage of the benefits in terms of power dissipation, the functional scope, safety concepts and the price advantages of the ARM architecture: based on available CPUs, they have developed and planned new embedded modules and systems to continue to provide customers with innovative products for applications in the IoT and Industry 4.0 area. In addition to secure and rugged hardware, a major component of an IoT/Industry 4.0 solution is the software. This results in the requirement that all data should be accessible everywhere and at any time. Everything should also be securely protected against attacks or manipulation. One possibility is a private cloud to which only one certain user segment has exclusive access. However, this requires increasing computing power, which results in undesirable higher power dissipation. There are databases that can meet these requirements, now also for small computing cores in the ARM area. All necessary information is retained for users and authorized users from the generated data with little computing power.

In IoT, sensor devices generate an incredible volume of data, which is distributed over countless decentralized networks. While a majority of this data is sent to centralized cloud services, routers and gateways (edge devices) are empowered to save and manage data for local analyses and queries. Relying completely on back-end or cloud services would limit the volume of information that could be captured and would pose a serious security risk.

SQL database enables embedded systems with lower performance to compress the raw data into meaningful information. By identifying recurring information and comparing certain patterns across different data sources, an embedded system can make intelligent decisions and offer helpful recommendations for keeping the information available. Database indices ensure that data can be processed with uniform performance and without overhead, regardless of the data volumes that are logged on each individual device. Database transactions protect the data and prevent corruption after an unexpected system failure at the same time. The use of an SQL database allows to simultaneously perform several actions through a multitasking process. A single database file is distributed reliably and efficiently.

If at all possible, users should not implement a data management framework that is customized, because this is usually very expensive and also often does not bring about the desired results. A market trend can be noted here: it is advisable to implement the requirements via a library solution that is well-supported and tested by the manufacturer. This offers easy development and maintenance in conjunction with an embedded ARM module. If developers use a TQ module or a platform with a previously modified ITTIA-SQL database solution for a development effort, this allows them to focus primarily on their application development and rely on a solution component to obtain the best data management configuration for the respective planned application.

Starting with Industry 1.0 through to Industry 4.0 the automation industry has seen an immense and rapid development. The most effective implementation is best achieved with partners that can rely on many years of development experience and solution expertise. Particularly in the area of embedded solutions, the ARM architecture constitutes a reliable, solid platform with long-term availability for the solutions of the future with an ecosystem best suited for this. ■

Product News

■ Artila: Linux-ready Cortex-A7 SoM with preempt real time patch

Artila Electronics announce a new SODIMM module based on NXP i.MX6ULL ARM Cortex A7 CPU core operating up to 800MHz speed with Linux OS. The new M-X6ULL is designed to meet the needs of many general embedded applications that require power efficient, high performance and cost optimized solution, as well as embedded systems that require high-end multimedia applications in a small form factor, this cost-effective M-X6ULL is ultra-compact in size with the form factor of 68 x 43 mm.

News ID 6158

■ Apacer upgrades to new-generation DDR4-2666 memory modules

The rapid confluence of artificial intelligence (AI) and the Internet of Things (IoT) have not only fueled an increasing demand for various smart application and smart devices and servers, but also increased performance demand in computing power and transfer speed. In response to the successive upgrade in Intel's and AMD's servers, desktop processors, and mobile processors platforms, as well as the increased support of adaptation of the DDR4-2666 specification, Apacer has outpaced its competitors in the mass production of DDR4-2666 memory modules for server and industry applications.

News ID 6153

■ Advantech: realize wireless network and device management with EIS-D210

Advantech announce a new generation of wireless connectivity Edge Intelligence Server EIS-D210 series. As smart cities and industry 4.0 deployment installs millions of IoT sensors and devices distributed in our environment, wireless communications has become the fastest growing sector and wireless networks have been part of every application. How to remotely manage distributed devices is the key issue for IoT. To echo market requirements, Advantech EIS-D210 series is powered by an Intel® Celeron® processor N3350, with LoRa/Wi-Fi/Bluetooth and WISE-PaaS/EdgeSense edge intelligence and sensing software solution built-in.

News ID 6227

■ Concurrent reloads VME product line based on latest generation processors

Concurrent Technologies announces two new VME boards for long life-cycle deployments that are expected to remain in the market beyond 2030. VP B7x/msd is based on an 8th generation Intel Xeon processor for applications that need high compute or virtualization capability. VP F6x/msd is optimized to maximize I/O capability and is suitable for those applications that need to boot legacy operating systems.

News ID 6321

Product News

Kontron: secure wireless and network router for airlines and business jet operators

Kontron announced the ACE Flight 1600 Gateway Router, a small form factor, avionics networking platform, purpose built to provide enterprise-class security and connectivity to and throughout the aircraft. Consolidating wireless connectivity, switching, routing, and security, means airlines, business jet operators and service providers can economically deliver new applications and services to the aircraft within a single securely connected platform.

News ID 6186

congatec accelerates real-time hypervisor adoption for the embedded market

congatec has acquired Real-Time Systems (RTS), a leading provider of hypervisor software for real-time applications in the embedded market. RTS will become a wholly owned subsidiary of congatec. The company will continue to operate independently, doing business as it always has, providing its software to run on any x86 hardware, but now with worldwide sales and technical support teams ready to support the product.

News ID 6092

MPL: ultra compact rugged managed 1Gbit Switch with 10 - 28 ports

The new µMAGBES is currently in endurance verification at MPL Switzerland. The new µMAGBES comes with 10 managed Gigabit Ethernet ports and can be expanded up to 28 ports. The new µMAGBES is currently available as open frame board solution. Packaged version built in a compact rugged housing with RJ45, M12, or MIL connectors will follow based on customer requests and requirements.

News ID 6189

EKF: interface for industrial with up to four RS-232 ports

Proven and reliable, RS-232 stays a popular point-to-point interface for industrial communication (IOT, Edge Computing). EKF presents the SU2-BALLAD, a peripheral slot card for CompactPCI Serial systems, equipped with four front panel RS-232 ports. Isolation barrier transceivers are provided for optimum noise and EMC immunity up to 921.6kbps data rate, as required for industrial use and operation in harsh environments.

News ID 6283

b-plus: visualization framework with various configuration options

The realization of autonomous vehicles requires - from the concept phase to series production development - reliable time-synchronous recording as well as the associated visualization of a very large flood of data in the vehicle, which is constantly increasing due to ever improving sensors.

News ID 6103

Interface Concept ComEth4510a dual Planes L2/L3 Ethernet Switch, selected by Thales for a radar application

Interface Concept announced that the ComEth4510a, a 6U OpenVPX Gigabit & 10/40 Gigabit L3+ Ethernet switch and IP Router, has been successfully integrated by Thales in radar applications. The ComEth4510a Ethernet switch provides a wide selection of 10/40 GbE interfaces together with high-speed switching capability (up to 664Gb/s) that significantly increase networking performances, required in defense and industrial application systems.

News ID 6106

Manhattan Skyline: Computer On Module with NXP i.MX 7ULP

The first member of the new and compact PicoCore COM product family by F&S Elektronik Systeme is offered with the NXP i.MX 7ULP ARM® based Applications Processor. Further pin compatible PicoCore COMs will follow. The module is based on an i.MX 7ULP Applications Processor implementing the Heterogeneous Multicore Processing architecture with ARM Cortex-A7 core and ARM Cortex-M4 core. NXP enables its heterogeneous concept with Linux running on the ARM Cortex-A7 core and FreeRTOS running on the ARM Cortex-M4 core.

News ID 6134

IBASE rolls out AGS series intelligent IoT gateway system

IBASE Technology rolls out its new generation Intel based AGS Series intelligent IoT gateway system aimed at industrial control and factory automation applications. It can be used as an IoT gateway serving as a platform to connect devices and securely transfer data to clouds, or as a Machine-to-Machine gateway providing interconnection of devices to enhance workflow, including wired and wireless, in various industrial environments.

News ID 6165

SECO becomes platinum member of Wind River Partner Program

SECO announce a new collaboration with Wind River as a Platinum Member Partner. The joint effort follows the path of research and innovation the two companies are pursuing in order to deliver the highest quality products to the broadest range of customers worldwide.

News ID 6245

New AMD embedded processors attract COM module manufacturers

This article is contributed by AMD

At the time of the official launch of the new AMD Ryzen Embedded and AMD EPYC Embedded processor families, the company had already garnered support from more than 20 partners. This article explains why these processors are attractive for embedded COM manufacturers.

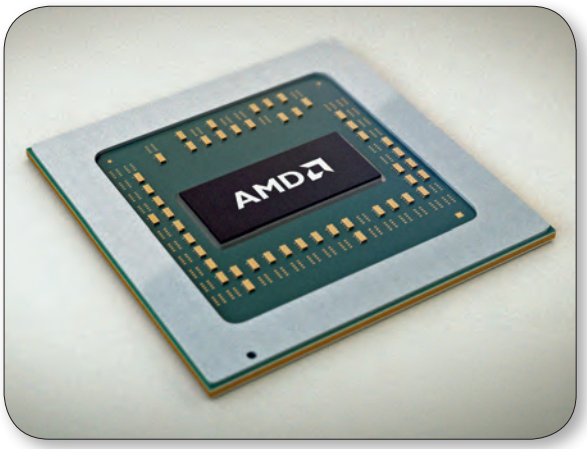


Figure 1. The AMD EPYC Embedded processor offers native 10GbE interfaces. It is therefore ideal for connecting manufacturing cells as part of the Industry 4.0. Even redundant system configurations are possible.

■ Leveraging its multi-functional design with a highly scalable thermal design power (TDP) of 12W to 54W, support for the AMD Ryzen Embedded V1000 Series is extremely broad. What attracts embedded board manufacturers most is the significantly greater performance driven by central processing unit (CPU) + graphics processing unit (GPU) integration, along with better pricing than competitive solutions. This processor offers up to 2x more performance than its predecessor and 46% more multi-thread performance than the competition. This is extremely important in today's multicore era with virtualization and parallel virus scanners, firewalls and intrusion detection solutions. What is more, the new AMD Ryzen Embedded processors have also made significant gains in graphics – which has been a core strength of AMD processor technology from the beginning. They now offer twice as much graphics performance as the AMD Embedded R-Series accelerated processing unit (APUs) (codenamed "Merlin Falcon") and up to 3x more graphics performance than the competition. All in all, the new AMD Ryzen Embedded V1000 APUs with Zen CPUs and Vega GPUs achieve a performance throughput of up to 3.6 TFLOPS. Thanks to these impressive performance figures, there is also a large portfolio of products to support the launch of these new processors. With AEWIN, Axiomtek, DFI, iBASE, Kontron, and Sapphire Technology, AMD has found six launch partners to support AMD Ryzen Embedded V1000 processors on the Mini-ITX motherboard standard. The advantage of this ATX compatible board standard is its comprehensive ecosystem. Manufacturers can rely on a variety of components, enclosures, and power supplies that are also used in the commercial sector, making their system designs comparatively fast, cost-effective, and future-proof.

The manufacturers of COM Express modules also provide comprehensive support for the AMD Ryzen processor, which covers the entire range of possible COM Express form factors. The COM Express Basic form factor (125 x 95mm) with Type 6 pinout is supported, for example, by Advantech, congatec, MEN, SECO and Portwell; while Kontron has managed to fit the AMD Ryzen Embedded on the slightly smaller COM Express Compact form factor (95 x 95mm). GE even goes one step further by squeezing the low-power processor variants on the COM Express Mini (85 x 55mm), which means the new AMD Ryzen Embedded processor is available in any size of the PICMG specification. A special variant is offered by MEN Mikro. The CB71C is an extremely rugged COM Express module that is both 100% compatible with the COM Express Type 6 pinout and also compliant with the VITA 59 standard. The latter specifies more robust mechanics to ensure reliable operation even under harsher environmental conditions than the COM Express specification allows. This means the module can operate completely fanlessly at significantly higher TDP. For this reason, the module is encased in a closed aluminum frame, which ensures optimum EMC protection and efficient conduction cooling while supporting a temperature range of -40°C to +85°C. The module is also pre-qualified for the specifications and certifications in critical applications such as rail transport or medical technology, and it is 'Made in Germany', which has its price, but pays off when there are high documentation and certification requirements.

Besides these universal board level platforms for a wide range of industrial applications, there are also a large number of providers who position their products for use in specific applications, such as IBASE and Arrow Electronics Intelligent Systems (Seneca) and AOPEN in the area of media players and digital signage systems, or Advantech Innocore and Quixant in the field of gaming platforms.

With its ABOX-5100 series, in-vehicle computing system provider Sintrones also offers a system designed for artificial intelligence (AI) applications that can accommodate up to four

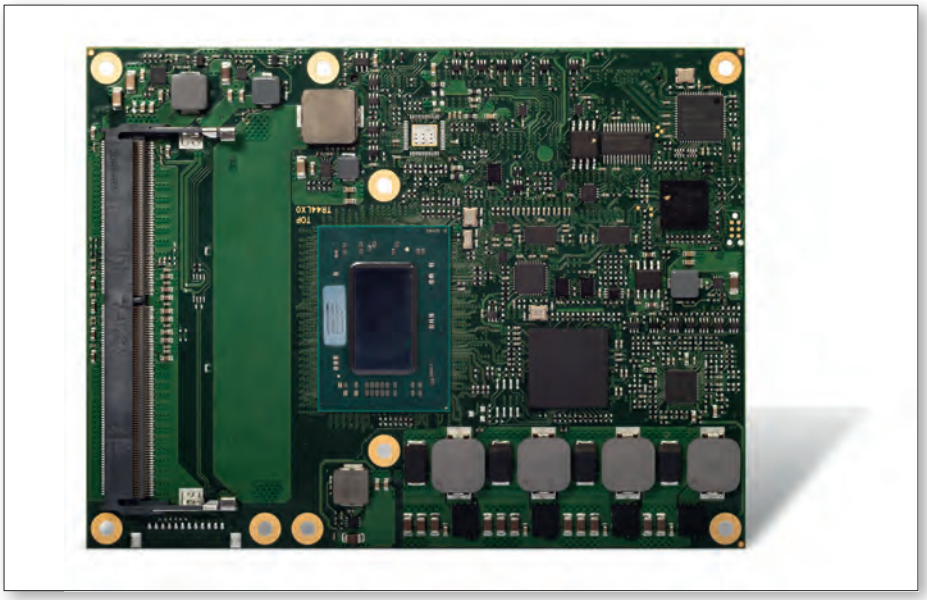


Figure 2. COM Express module with AMD Ryzen Embedded processor conga-TR4 available from congatec.

Figure 3. The VITA 59 compliant COM Express Rugged standard allows fanless operation of AMD Ryzen Embedded processors even at TDPs over 35W e.g. on MEN Micro CB71C board.

GPU expansion cards. It supports both AMD Embedded Radeon E9260 GPU and Nvidia GTX-1050TI GPUs, as well as AMD Radeon Vega GPUs. Areas of application include deep learning and virtual reality for industrial automation, self-driving vehicles and intelligent transport systems. Three full-size mini-PCIe slots for internal expansion plus an M.2 A-E Key 2230 for WiFi/GPS/4G LTE are also available.

The AMD EPYC Embedded 3000 processors, which are also based on the Zen microarchitecture and of key importance for the edge, networking and storage sectors, deliver outstanding performance with up to 2.7 times more performance per dollar. With up to 64 PCIe Gen3 lanes and 16 SATA ports, they also offer twice as much connectivity as the competition. Seagate Technology, for example, is seeking a minimum of 40 percent performance improvement over prior generation product architectures at a lower cost for its customers, which AMD helps enable through the EPYC Embedded 3000 processors, in addition to delivering enterprise-grade reliability, availability and serviceability.

Such and comparable solutions can be used even in harsh environments, in the extended temperature range and for periods of 10 years when assembled into a BGA package and are perfect for the many decentralized fog data centers that are currently being installed on the edge of the IoT. The advanced AMD EPYC Embedded processor is ready to support network function virtualization (NFV), software defined network (SDN) plus – with ECC support – real-time industrial system requirements, and more. A total of eight 10GbE channels are available for setting up micro server connectivity on the factory floor. iBASE, for example, plans to use this comprehensive offering in its new FWA8800 network appliance for security, firewall and UTM tasks. Equipped with a large number of network interface modules, it also supports 25G/10G/1G optical and copper ports and impresses with a long service life of up to 10 years.

Interestingly, none of the classic embedded board level manufacturers is currently supporting the AMD EPYC Embedded 3000 processor. This is because there is no classic embedded form factor for this new performance class at the edge/fog server level. However, a design analogous to the VITA 59 would enable fanless cooling up to the eight core version with 50W TDP. At the Server-on-Module level, the fact that COM Express Type 7 can only provide up to 4x 10GbE lanes is an ongoing obstacle.

The new AMD EPYC processor, on the other hand, already executes eight of these interfaces and can therefore connect up to six local instances over 10GbE if Industry 4.0 server nodes are connected in line over 10GbE loopback. It therefore presents a perfect performance class for extremely powerful edge servers, which so far have been lacking an embedded form factor that would enable them to find immediate support upon the launch of the processors. So, we're curious to see which manufacturers will present some kind of cube design for Industry 4.0 edge servers based on the AMD EPYC Embedded processor in the next few months. IoT connected high-performance applications would definitely benefit from it. ■

Product News

■ PICMG announces agreement with DMTF to collaborate on Industrial IoT

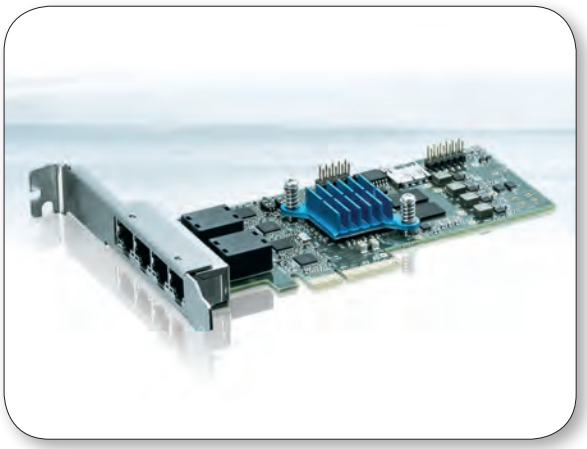
PICMG announced that a work register has been formed with the Distributed Management Task Force (DMTF) to collaborate on IIoT efforts. The DMTF, an industry standards organization, creates open manageability standards spanning diverse emerging and traditional IT infrastructures including cloud, virtualization, network, servers and storage.

News ID 6305

A new dawn in the factory: OPC UA and TSN conquer the shop floor

By Norbert Hauser, Kontron

Fieldbuses will not vanish completely from industrial automation in the foreseeable future, yet the Ethernet standard for time sensitive networking (TSN), in conjuncture with the platform independent OPC UA (Open Platform Communications Unified Architecture) interoperability standard, already offers new ways forward.



The standard Kontron network card includes an integrated switch for redundant networks with two or four gigabit Ethernet ports. It meets all specifications of IEEE 802.1 and is especially suited for rough industrial environments.

In evaluating manufacturing processes for digitization strategies (think industry 4.0 and industrial internet of things (IIoT)), it became apparent that the current distinction between IT (information technology) and OT (operational technology) would have to be gradually dismantled to warrant performance, cost and manageability of future infrastructure. TSN plays an important part in this, as it signifies the extension of the existing Ethernet standard towards deterministic data transfer (real-time capability), thus offering the main element for the convergence of IT and OT on the transport layer. The OPC UA interoperability standard allows the seamless, secure, and reliable flow of information between devices of different manufacturers and further drives the convergence of industrial infrastructures. With OPC UA, the new security, data modeling, scalability, and expandability requirements are optimally addressed.

Among the drivers of this inexorable trend are the rapid development of embedded hardware for IoT devices and technologies such as Cloud computing. But for establishing them in challenging industrial environments, appropriate standards are necessary. The two standards gaining traction rapidly are Open Platform Communications Unified Architecture (IEC62541 OPC UA) in conjecture with Time Sensitive Networking (IEEE 802.1 TSN). TSN is starting to supplant traditional fieldbus specifications and has the potential to replace them in the medium-term. Establishing a standard requires players on the manufacturer and user side working hard to prepare the market. The big IT players, Microsoft chief among them with its Azure IoT Edge Cloud offerings, are moving ever closer to the base of the automation pyramid. This is why Kontron has decided to have many of its embedded PCs and workstations - some of them as embedded servers, too - Microsoft Azure IoT Edge-certified for Fog and Edge computing. At this point, this includes more than 20 products, with their number growing continually. As for standards, Kontron fully supports OPC UA and TSN.

The OPC Foundation developing and defining the OPC UA standard counts more than 590 renowned companies and organizations among its members as of March 2018. These include manufacturing companies, suppliers, but also technology providers. The standard is important, because it enables the connection of the field level to the IT level device and operating-system independently. To ensure the standard success, Microsoft has published the corresponding specifications as open source software. Unlike the previous version, which ran on Windows exclusively, it now supports all common operating systems.

TSN makes convergent Ethernet-based networks running IT data transfers in parallel to time-synchronous, deterministic communication possible, which are indispensable for time-critical machine control and processes. The IEEE 802.1 TSN specifications - such as timing and synchronization, time-aware traffic scheduling, frame preemption, seamless redundancy, network configuration and others – guarantee data packets can be delivered in a timely manner and with high availability on a standard Ethernet network, if required. In industrial aplications, Ethernet TSN with guaranteed latency and quality of service (QoS) with time-sychnronization can supplement, or in the middle-term replace, proprietory fieldbusses in manufacturing machine control, while seamlessly communicating with the IT layer.

In late November 2017, Kontron introduced the first version of a network interface controller (NIC) enabling Time Sensitive Networking (TSN). The standard PCI Express network card and the associated network and switch drivers for Linux allow for industrial computers to be connected through a redundant ring-, line-, daisy-chain- or star-shaped TSN network. The Kontron TSN network card includes an integrated switch for redundant networks with two or four gigabit ethernet ports, and for connecting to the host

computer via PCI Express. Future extensions of the TSN specifications can be integrated through software updates in the FPGA. The TSN network card is especially suited for rough industrial environments and can be run in industrial temperature ranges from -40 to +85 degrees Celsius. It allows for the Kontron Box PCs, 19-inch servers, and workstations, namely its KBox C-series, ZINC19, and HPW product lines, to be extended for TSN. The TSN starter kit, available since the embedded world trade fair in March 2018, includes a KBox C-102 industrial computer for central control via the integrated TSN network card with the associated software included.

With the network card and Microsoft Azure Cloud support, Kontron is definitely doing its share in promoting the quick spread of TSN and the OPC UA standard. The TSN system starter kit is also offered as a private labelling version to enable machine manufacturers, automization specialists and systems integrators to expand their portfolio with TSN-connected products under their own brand, offering time-to-market-advantages to their customers for the integration of TSN networks. Today, the cumbersome interfaces between IT and OT are often an impediment to innovation. 59 percent of all SMBs name innovation cost as the obstacle for not using Industry 4.0 technology comprehensively. Companies appreciate the advantages: 72 percent hope for increases in production flexibility, 52 percent expect quicker reaction times, and 47 percent hope to raise their plants' efficiency. These are the results of an Ernest & Young survey published in November of 2017.

The rigid barrier between operational technology at the base and information technology at the top of the automatization pyramid is beginning to dissolve. Many areas of the field level, such as machine control, which seemed out of reach of internet-protocol-based technology, are nearing a turning point. Kontron in co-operation with S&T is not only well positioned to supply the appropriate hardware, but pre-integrated Cloud solutions such as Azure IoT Edge and other software, services and consulting also. ■

Product News

■ Ikalogic builds first wifi oscilloscope probe

In late 2017, Ikalogic created the very first wifi based oscilloscope probe: IkaScope WS200. With just over 30MHz bandwidth and 200MHz sampling rate, the WS200 is not designed to compete with high-end benchtop oscilloscopes. However, it is a highly ergonomic tool that can provide quick and reliable diagnostic in many on-the-field applications.

News ID 6291

■ IAR enhances Amazon FreeRTOS integration for Arm Cortex-M-based IoT applications

IAR Systems has released a new plugin for the IoT Microcontroller Operating System Amazon FreeRTOS, providing a high level of control and visibility within IAR Embedded Workbench for Arm. The new plugin adds task awareness for all Arm Cortex-M devices, providing developers with full control of the execution at the task level and enabling display of the local execution context for each individual task within the IAR Embedded Workbench IDE.

News ID 6086

■ Keysight to accelerate development and deployment of 5G networks

Keysight Technologies announced successful inter-operability testing of Keysight's User Equipment (UE) Emulation Solution and Samsung's new 5G base station based on 5G New Radio (NR) standards. Keysight and Samsung have agreed to align their plans to enable 5G base station testing and build an ecosystem of interoperable products.

News ID 6076

■ Parasoft launches MISRA Compliance Pack and ISO-26262 Qualification Kit

Parasoft presents their automotive software test automation solution. At the core of the solution is Parasoft C/C++test, a unified C and C++ development testing solution that helps organizations address software development best practices by providing automated testing tools that simplify unit testing, code coverage, traceability, static code analysis with built-in support for MISRA, and more.

News ID 6205

■ HCC Embedded: MISRA-compliant embedded cryptography suite and manager

HCC Embedded has released its CryptoCore embedded-cryptography suite to ensure that IoT devices can be managed securely. All CryptoCore software libraries are managed through HCC's Embedded Encryption Manager (EEM), which provides a high-quality standard interface to any hardware or software cryptography implementation. This greatly simplifies the design process, makes software portable, and enables use of software crypto-libraries or hardware-accelerated algorithms on chips that provide them.

News ID 6085

Optimised semiconductors help in making robots collaborative

By Clemens Müller, Infineon

The robotics revolution has spawned a new type of industrial robot – the so-called collaborative robots. They feature advanced sensor and control components that limit power and force in order to eliminate critical collision situations entirely. Modern microcontrollers with safety functions, high-speed precision sensors as well as efficient power components enable these robots to work safely with, and not just for, humans.

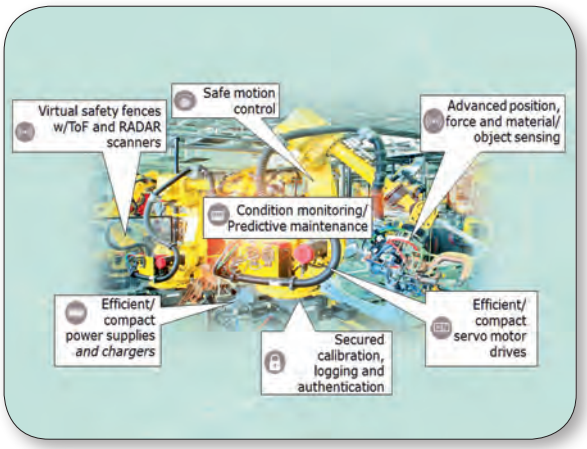


Figure 1. There is a broad application field for modern semiconductor products relating to the new generation of robots.

There is a new generation of robots on the rise which is about to revolutionize the way production lines in modern factories are set up. This new generation is called collaborative robots, otherwise known as cobots. They work alongside people, support them in the respective manufacturing processes and increase the quality of the finished products thanks to their highly precise and safe working methods. Unlike classic industrial robots, cobots work without a safety cage and interact directly with humans. To meet the associated requirements, their design must incorporate certain characteristics. In particular, special safety measures are required so that robots and humans can work together safely.

The most important design criteria for cobots are sensitivity with respect to their working environment, low system weight and small form factors achieved by high power density and tightly integrated electronics. High precision, integration and efficiency as well as different topologies in terms of number of axes, joints and motors are additional important issues. Another major aspect comprises security as a prerequisite for functional safety, which means protection against any unauthorized modification or even criminal manipulation as well as safeguarding of intellectual property such as algorithms implemented in software. They are very often the key differentiating aspects among different cobot platforms. With intelligent, integrated and efficient semiconductor solutions, these requirements can be met in the development of modern collaborative robots, but also conventional industrial robots are profiting. And the market offers potential. For 2015, sales in the market for industrial robots reached nearly $10 billion worldwide. Between 2015 and 2020, analysts are predicting a growth of about 23% for the collaborative robots alone.

Functional safety is essential for all robots, especially if they are used in a collaborative setting, working closely with humans. Aspects like system redundancy, highest quality constraints etc to achieve functional safety are one part of the equation. Because robots can only be truly functionally safe when they are embedded in secure systems. This is an aspect which is increasingly important in the context of tightly connected Industry 4.0 and industrial IoT system solutions. Encryption is used to ensure that the robot only executes functions it has been programmed for and that critical data such as calibration data cannot be manipulated. In particular, the robots as part of the manufacturing process are secured against manipulation in case of wired or remote software updates. Security also requires secure authentication of individual users and various access permission levels as well as the authentication of newly added or replaced components. Calibration is necessary for the correct functioning of the robot. If, for example, a hacker manipulates the calibrations, the robot could then exceed the given limits of movement. This is where security and safety converge – without efficient security protection, there is no functional safety. This is an important requirement for future systems, which is addressed by dedicated security controllers (OPTIGA family) or AURIX microcontrollers with features such as the HSM (Hardware Security Module). Since the security functions are implemented in the hardware, users require only little detailed knowledge of encryption technologies. In addition, the impact on existing software implementations is extremely low!

There is a broad application field for modern semiconductor products relating to the new generation of robots. The spectrum ranges from motor control, high-performance position and object detection, efficient and compact drives, efficient and compact power supplies and chargers, and the implementation of virtual safety gates to security functions with secure authentication and calibration. In addition, IP protection, especially for start-up companies whose know-how is based on the algorithms, is essential. A key criterion for the new generation of robots

Figure 2. At Infineon's Dresden production facility, a robot is used which can also anticipate directions of movement. It works with ToF 3D cameras, and will make use of a redundant 24 or 60 GHz radar system.

is a design that is as compact as possible, in particular a space-saving and efficient motor control unit. This is made possible by IGBTs or low-resistance MOSFETs (e.g. OptiMOS), highly integrated gate drivers with built-in protection and integrated power modules, so called IPMs that combine the complete power control infrastructure within a single package. Advanced robot control algorithms rely on highest precision parameter capturing such as torque, position, pressure, etc with corresponding sensors. Data then needs to be processed with powerful safety controllers such as the AURIX family.

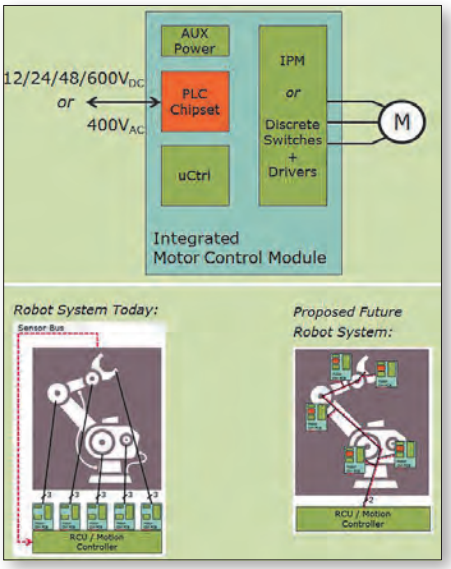


Figure 3. Thanks to modern semiconductors and the integration of powerline-like modulation along with the motor control electronics, the number of cables in a robotic arm can be reduced from nearly 30 down to just 2 or 3.

If you want to liberate robots from their cages, it is necessary to ensure that people do not even come within the critical range of a robot working at high-speed and precision, which could result in them being injured either through their own fault or malfunctions. Designing robots with the corresponding degree of sensitivity is only possible with sophisticated sensor technology. Basically, it is important to make the area between the person and robot safer, and also between robots themselves. This is about making the protection zones more flexible; i.e. that a greatly reduced protection zone moves along dynamically with a moving robot arm, for example. A zone concept is used when implementing the virtual fences. By way of example, only a warning signal is triggered when approaching in the first warning level, whilst the robot continues to operate at full speed. On approaching further, the speed is then reduced with the corresponding warning. Only in the immediate danger area does the robot stop.

Corresponding protection mechanisms require extremely precise 3D object recognition. Redundant sampling ensures maximum functional safety. It is also helpful to capture the direction of movement, for example whether a person approaches and then moves away again, or whether they enter the danger area. Intelligent detection of the actual danger situation prevents unnecessary downtimes or slowing down of the robot work – and accordingly production losses and costs. In this area, Infineon is working with partners on time-of-flight concepts (ToF) and radar sensors. This solution allows the environment to be scanned in 3D at more attractive system costs than with traditional LIDAR scanners.

Figure 4. Based on an Arduino shield, a monitoring/sensor box supplies the data needed for predictive maintenance.

On the basis of the 3D resolution and using special algorithms, it is possible to anticipate the directions of movement, for example. The prototype of a robot, which recognises its surroundings with ToF 3D cameras, and which in future will be able to anticipate directions of movement, has already been successfully tested at the Infineon production facility in Dresden. A redundant, sensor fusion-based extension to 24 or 60 GHz radar systems is in preparation.

Traditionally, an industrial robot is based on a central motor control and numerous drives in the axes. This requires a considerable amount of wiring for a typical robot arm with thick motor cables (3 or more phases) per motor, plus an additional communication bus for control purposes and reading out sensor data. Thanks to modern semiconductors and the integration of powerline-like modulation (power line communication technology, PLC) together with the embedded motor control electronics, this outlay can be significantly reduced and thus also weight and overall system costs. In initial laboratory experiments, Infineon has succeeded in reducing the number of cables in a robot arm from almost 30 down to only 2 to 3.

At the same time, although no algorithmic or electrical optimizations have been made, transmission speeds of well over 100 Mbps were achieved. The potential for optimized parameter tuning is well understood and will be addressed together with partners on a ready-to-use servomotor control prototype, which will allow testing of the technology within realistic application scenarios. Less wiring not only means lower weight but also fewer interfaces. Since this is important for harsh manufacturing environments it can be translated into increased reliability. An initial prototype of such a motor control, for which Infineon is integrating the necessary components, is in preparation. The corresponding PLC chipset and coupling devices for supporting 12, 24, 48, 600 V DC or 400 V AC will be directly integrated into the inverter modules at a later time. This way it will be optimally adapted to the existing power electronics and the switching algorithm within the inverter stage. Thanks to the intended integration of PLC technology and the higher power density of the motor electronics, it will be easy for the development teams to install locally controlled motors directly in the axes of the robot.

Systems associated with Industry 4.0 also require efficient predictive maintenance. The status of the motors, their controls and the entire system have to be queried non-invasively by monitoring the voltage, current strength, frequency, temperature, pressures, noises, gases, etc. Subsequently, the data has to be processed and compared with reference values on the basis of machine-specific algorithms and sensor values. With corresponding monitoring, downtimes can be reduced and the foundations laid for Industry 4.0. Allowing engineers to develop their own monitoring and prediction algorithms, Infineon has built up a sensor box for prototyping purposes, which can be connected via Wi-Fi or USB to a PC. Users can randomly select up to two Arduino shield-like sensors that can be plugged on top of each box. Up to four boxes can be connected via a USB hub to a total of eight sensors, such as silicon microphones, pressure, current, angle, CO2, radar and magnetic 3D sensors. All sensor data is being provided in a digitalized format. Thanks to the broad sensor portfolio, this prototyping solution enables interested customers to select the optimum set of sensors for their monitoring function, and to easily develop their own algorithms for each particular application they require. ■

Product News

■ Infineon: new soft starter modules - one foot-print fits broad range of current classes

Infineon is launching Infineon Power Start designed for low voltage soft starter applications. The new module family meets the market's needs for cost effective and compact semiconductor solutions. With its new design, Power Start focusses on reducing complexity and number of components. Customers, in return, profit from shorter development times and simplified production processes of soft starters. Typical low voltage soft start applications include belt conveyors, big fans, and mills.

News ID 6119

■ Silicon Labs: Wi-Fi devices for the IoT slash power consumption in half

Silicon Labs has introduced a new Wi-Fi portfolio to simplify the design of power-sensitive, battery-operated Wi-Fi products including IP security cameras, point-of-sale terminals and consumer health care devices. Optimized for exceptional energy efficiency, the WF200 transceivers and WFM200 modules support 2.4 GHz 802.11 b/g/n Wi-Fi while delivering the high performance and reliable connectivity necessary as the number of connected devices increases in home and commercial networks.

News ID 6084

■ ON Semi: image sensor platform enables new functionality for industrial camera design

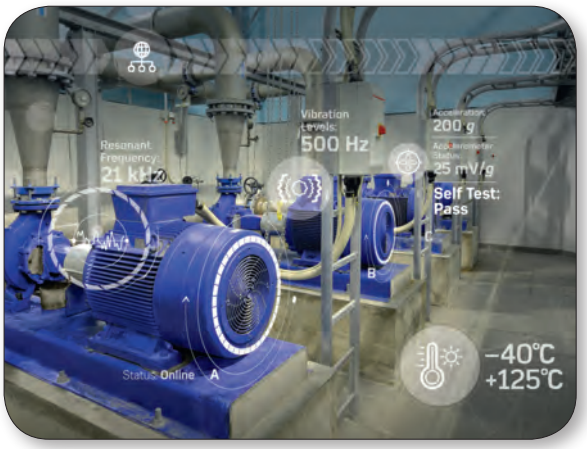
ON Semiconductor has announced its X-Class image sensor platform, which allows a single camera design to support not only multiple product resolutions but also different pixel functionality. The first devices in the new platform are the 12megapixel XGS 12000 and 4k / UHD resolution XGS 8000 image sensors, which provide high-performance imaging capabilities for applications such as machine vision, intelligent transportation systems, and broadcast imaging.

News ID 6129

Five challenges faced by Time Sensitive Networking in supporting the IIoT

Based on information from Analog Devices

This article highlights the contribution Time Sensitive Networking makes towards providing deterministic performance over Ethernet.



■ The ongoing development of Time Sensitive Networking (TSN) has resulted in significant updates to both the IEEE 802.1 and 802.3 standards. Essentially a set of deterministic Ethernet extensions, TSN is also the successor to Audio Video Bridging (AVB), the IEEE project initially designed to support real-time media streaming within professional audio and video environments (such as live DJ sets). Once AVB caught the attention of automakers, though, the seeds for TSN were sown. The cars of tomorrow have long been envisioned as sophisticated vehicles, equipped with high-speed IP network connectivity, intelligent and automated driver assistance/braking systems, infotainment portals, simplified internal wiring harnesses and lighter overall weights. The drive toward these features has yielded many auxiliary benefits to the industrial automation industry, too.

Creating a converged IEEE 802 specification, using Ethernet, was the most obvious solution to the problems standing in the way of such a vision. More specifically, the automotive sector could use deterministic Ethernet to overcome limited in-vehicle bandwidth and eliminate the need to resort to a gaggle of legacy networking protocols – e.g. FlexRay, LIN and MOST – to link various car systems together. Remove the in-vehicle part of that sentence, along with the references to the automotive-specific protocols, and you get a close approximation of the five challenges that the automation industry has faced as the Industrial Internet of Things (or Industry 4.0) continues to come into focus.

Supporting mixed traffic. Ethernet has been put forward as a one-size-fits-all automotive network that can streamline the different domain architectures inside cars. Via TSN, it can fulfill a similar role in industrial networks by handling mixed traffic in automation and control systems, power utilities, wind turbines and printing (see reference 1 below). TSN should excel at transporting time-stamped, latency-sensitive data regardless of any best-effort traffic that may be present on the same network. This is essential with Ethernet, which is much "noisier" than previous automation networks that carried only real-time data and not a diverse mix of protocols. TSN is designed to handle multiple traffic types.

Providing interoperability. In the IIoT in particular, the use of standard components manufactured in large volume is essential. This is due to central issues of scale and cost that weigh down many current approaches to networking. Relying on special ASIC-based industrial Ethernet implementations and/or legacy fieldbuses (including but not limited to the ones used in cars, such as CAN) is less scalable or cost-effective than simply leaning on commercial silicon that can still support regular HTTP interfaces, Web services and diagnostics (reference 2). TSN helps keep costs down and a path open for future expansion.

Ensuring tight synchronization. AVB evolved into TSN in order to handle particularly demanding applications such as the Advanced Driver Assistance System (reference 3). ADAS requires multiple systems to work seamlessly in concert to account for braking distances and human reaction times. TSN includes several mechanisms for ensuring such determinism across similar settings such as the IIoT, namely: improvements to the Precision Time Protocol, redundant path availability for any data stream, convergence of Quality of Service onto the TSN over an Ethernet network at reduced bandwidth (without compromising real-time guarantees, though), and bandwidth reservation – a central feature carried over from AVB for ensuring deterministic performance.

Supplying sufficient bandwidth. One of the decisive advantages of Ethernet over legacy serial fieldbuses – i.e. everything from PROFIBUS to Modbus – is that it can provide much more bandwidth to applications of all types. In automobiles in particular, the limited data

rates and capacity of CAN made it insufficient for the next generation of in-vehicle applications, which opened the doors for Ethernet (in the form of AVB). Applications like machine vision and 3D scanning require a lot of bandwidth. The same can be said for many of the fieldbuses still in use in control systems. Increasingly important applications such as machine vision and 3D scanning require a lot of bandwidth; TSN over Ethernet can provide it.

Making network infrastructure simpler. TSN is meant to be a consolidated and easy-to-use approach to deterministic Ethernet networking. Rather than having to rely on multiple infrastructures to handle different types of traffic, everything can be carried over Ethernet. A 2015 podcast hosted by David Greenfield of Automation World, while it did not bring up TSN specifically, did a good job of outlining general advantages of Ethernet over fieldbuses (reference 4). Guest Sari Germanos of the Ethernet POWERLINK Standardization Group talked about how complex applications (like the ones mentioned) strain the limits of legacy network architectures. Ethernet, in the form of TSN, is already addressing this problem in cars. A recent EE Times article provided a look at how the domain architectures in a vehicle could be rearranged if legacy technologies did not have to be supported. Ethernet would serve as a backbone bus to connect the various application domains, making better use of bandwidth. It can do the same for the IIoT (reference 5). "As [industrial] IoT adoption continues, increased amounts of data and widely distributed networks will require new standards for sharing and transferring critical information," explained Todd Walter of National Instruments, AVnu Alliance Industrial Segment Chair, in a Design World article (reference 6). "Just as an ambulance or fire engine receives priority among other traffic during an emergency, the TSN standard ensures that critical, time-sensitive data are delivered on time over standard network infrastructure." TSN moves beyond being just an idealistic project and instead becomes a widely used standard that is certified by industry groups. The points outlined already show it already has a strong technical base. The next thing to watch is how its testing and deployment play out. In late February 2016, Bosch Rexroth, Schneider Electric, National Instruments and Kuka announced their joint work on the first TSN testbed in the world (reference 7). This testbed is designed to combine various traffic flows over a TSN over Ethernet network. It will test the multi-vendor interoperability of TSN, as well as its security features, performance, latency and integration with cloud-based control systems.

National Instruments is hosting the testbed. One of its executives, Eric Starkloff, commented that TSN is "necessary for the future of the IIoT," highlighting how far a converged deterministic form of Ethernet has come from its roots in pro A/V technology. The scope of the IIoT could prove to be enormous, but many enterprises still have a way to go in terms of understanding and harnessing its benefits. A mature and widely adopted TSN will help them get there. ■

Product News

■ TI: MSP430 MCUs offer configurable signal-chain elements for sensing applications

Texas Instruments announced the addition of new microcontrollers with integrated signal-chain elements and an extended operating temperature range to its MSP430 value line portfolio. New MSP430FR2355 ferroelectric random access memory MCUs allow developers to reduce printed circuit board size and bill-of-materials cost while meeting temperature requirements for sensing and measurement in applications such as smoke detectors, sensor transmitters and circuit breakers.

News ID 6318

■ Microchip: 2D Touch Surface Library easily implements touch pads with surface gestures

Microchip Technology announces a new 2D Touch Surface library that enables designers to easily implement touch pads using the company's 8-bit PIC and AVR microcontrollers and 32-bit SAM MCUs. Available free of charge with the purchase of any compatible MCU, the library provides a simplified, low-cost solution for embedded applications.

News ID 6287

■ Microsemi: integrated FPGA-in-the-loop workflow for PolarFire and SmartFusion2 development boards

Microsemi announced its collaboration with MathWorks to launch hardware support for FPGA-in-the-loop (FIL) verification workflow with Microsemi FPGA development boards. The new integrated FIL workflow with HDL Coder and HDL Verifier from MathWorks enables customers to automatically generate test benches for hardware description language (HDL) verification, including VHSIC Hardware Description Language (VHDL) and Verilog, providing rapid prototyping and verification of designs.

News ID 6214

■ ADI: single channel 16-bit DAC enables high density analog output modules without de-rating

Analog Devices introduced the AD5758 DAC. It incorporates the company's second-generation Dynamic Power Control to enable high density AOUT modules without requiring derating the need to turn off channels due to thermal build up resulting in lower cost, more compact designs. This single-channel current/voltage DAC with DPC is designed for channel-to-channel isolated industrial applications in factory automation, process automation, and motor control. The AD5758 is ADI's lowest power industrial DAC.

News ID 6284

■ Infineon: PWM controller IC and latest 700 V/800 V CoolMOS P7 MOSFET in a single package

Infineon Technologies announces the fixed frequency 700 V/800 V CoolSET 5 th generation. This solution combines a PWM controller IC with the latest 700 V and 800 V CoolMOS P7 MOSFETs in a single package. The single platform supports isolated and non-isolated flyback topologies. The new fixed frequency 700 V/800 V CoolSET uses a high voltage Superjunction MOSFET in combination with an internal current regulator in a cascode configuration. This combination provides rapid startup, and easy implementation of brown in protection.

News ID 6163

■ ST: single-chip three-phase and three-sense BLDC driver

STMicroelectronics' STSPIN233 is a low-voltage motor driver suitable for both single-shunt and three-shunt brushless-motor driving integrating a 200mΩ 1.3Arms power stage, in a slim and compact 3mm x 3mm package.

News ID 6220

■ Laird: Web-based Thermal Wizard tool simulates cooling applications

Laird has launched a comprehensive thermal management tool that helps engineers quickly select the optimum solution for their application. The Web-based Thermal Wizard employs proprietary application calculators to determine the optimal thermal management solutions at the thermoelectric module, thermoelectric assembly or liquid cooling system level. Building upon Laird's popular AZTEC thermoelectric module) simulation software, the Thermal Wizard enables thermal designers to input their known cooling requirement.

News ID 6279

Next level of vision technology turns machines into smart partners

This article is contributed by Framos

With image-based artificial intelligence, vision systems provide accurate analyses of environments and objects. The 3D technology develops with simple-to-integrate building blocks and generates a new level of perception in real time. Intelligent algorithms can make valid decisions.

■ 3D Imaging and Artificial Intelligence (AI) as individual building blocks are no longer brand new, as image processing has reached the next level with the combination of both technologies. The reason for this lies primarily in the technical development and digitalization of image processing, which has created an enormous market demand in recent years and made it possible for vision systems to take the leap to the mass market. Perceptional computing generates a new level of perception with 3D sensing, and AI enables accurate, real-time analysis without the 2D distortion and delay of assumptions and simulations. The machines are equipped with human senses. The visual 3D sensor makes them see and the AI lets them understand, allowing both machines and devices to interact with their environment and cognitive learning. In industrial automation, machines and robots can now make valid decisions themselves.

Machines and devices with integrated vision technology can also be controlled without contact. The tracking of eyes, faces and movement is the basis for intelligent and novel consumer goods, security applications and industrial solutions. Smart Homes, for example, can be controlled with the touch of a finger, coffee machines can detect who is standing in front and automatically prepare their favorite coffee and cars slow down should the driver fall asleep. In the industry, the precise detection of objects and the exact detection of position and distance come into play. 3D sensing provides robots with the mechanical skills to grab like humans and avoid collisions with its environment during movement. Drones fly around obstacles. By networking multiple robots or 3D-sensing devices, companies can leverage the full optimization potential of intelligent algorithms for their processes.

Robots have been used in industry for decades. They were programmed to detect obstacles in 2D and navigate around the room using markers, thus being reliable aids. 3D sensing and AI algorithms, on the other hand, make industrial robots real partners and thoughtful colleagues. The 3D technology makes robots fast, allowing them to recognize once unknown objects in real time. The position and distance measurements are no longer based on old data, CAD models, or vague assumptions - the robots now recognize and act immediately with high precision. For example, random-picking applications can be implemented and in quality assurance, 3D cameras are also much faster and more accurate, as well as less complicated during construction. Especially where both man and machine share a work space, the speed and precision provided by 3D improves safety and, for example, can make protective fences obsolete. Now, both man and machine can work hand in hand in the truest sense of the word.

Self-learning algorithms allow networking between various devices and machines, so they can independently coordinate with each other. This option is particularly relevant in the logistics sector with many unexpected and unpredictable events, but it also allows production in batch size 1. The big advantage is that 3D imaging does not have to be trained, 3D technology looks like a human and learns in combination with AI. 3D technology enables easy interaction and collaboration between robots and humans. At the moment, small logistics robots are experiencing a big boom. The intelligent and interconnected R2D2's drive through the warehouse, lift and move boxes, grab objects and bring them to workers, and of course clear up these boxes and objects. With accurate object, position and distance detection based on the 3D data of the robotic camera, the digital service providers can use SLAM cartography to record their environment within seconds and navigate independently. They detect both fixed and mobile obstacles and avoid collisions even in new, unknown situations. Several networked robots communicate with each other and coordinate their actions, thus independently ensuring a smooth process in the warehouse and optimal support of workers

and processes. These small all-round robots increase efficiency in the logistics chain immensely. In the future, small or large helpers are also conceivable as digital liftboys and room service in hotels or inventory services in supermarkets. Munich Airport is already testing a mobile service robot called Josie Pepper to inform travelers and accompany them to the right departure gate.

There has already been a lot of talk about digitally monitored houses and self-containing refrigerators. The 3D technology and intelligent algorithms open up many new application possibilities in the so-called Smart Homes, especially for home security and surveillance which benefit immensely. A great deal is already a reality, such as drones, which transmit a live image to the homeowner's cell phone as soon as a suspicious movement is detected in the garden - and it is not a stray cat. The most visible practical use in everyday life is currently being generated by intelligent 3D technology for vacuum cleaners and lawn mowers.

Again, good work has been done with 2D imaging, but 3D makes the difference. Through 3D recognition, objects are not simply captured by their outlines, as the AI can classify and categorize things. So, the wedding ring is not mindlessly consumed by the vacuum, but rather classified as precious jewelry and avoided. Or the dog pile being bypassed rather than sucked up - YouTube already shows enough (very funny) videos showing how 2D technology distributes excrement across the floor. By means of 3D navigation and the intelligent mapping of the environment, a structured cleaning is now possible. Instead of using tactile sensors on a collision course, furniture, carpets and trees are visually recognized and bypassed in advance. An intelligent lawn mower detects where the lawn edge ends, stops there and realizes that the small pile in the grass is a hedgehog, which must be dodged.

The next-level vision technology enables not only the technological advantages but also new business models. Those who must still spend large sums on a vacuum cleaner robot could save a lot of money in the future with advertising-based leasing models. The intelligent and networked vacuum cleaner knows the exact size of the apartment needed to be cleaned, the floor plan, the brands and the condition of the furniture, as well as the individual furnishing styles. This allows conclusions to be drawn on the income and, with the appropriate consent, individualized advertising. A furniture store can thus propose to potential customers a couch that matches the dimensions, the style and the price based on their exact living conditions.

With these data-based models, the purchase of the vacuum cleaner would be very favorable since the manufacturer makes their profit with the data sales. Also conceivable are leasing models in which the customer pays for each use and receives advertising accordingly. Drones demonstrably offer a high practical use potential for the integrated 3D technology with AI. None of the popular self-propelled, follow-me drones could navigate without this combination. Intelligent drones monitor agricultural growth and hyperspectral drones can distinguish rocks from potatoes during harvest. Surveying industrial sites in inaccessible terrain is unimaginable without 3D drones delivering better and more accurate data than ever before, in real time. Thanks to the miniaturization, the modern 3D technology is so light and the processing processors so small that they are no longer a limitation even for ultralight drones. The high level of efficiency and innovation of drones for companies reflect two creative examples of practice.

A power company, for example, uses smart drones to monitor its electricity pylons. No technician today has to climb dangerously high by default. Rather, the technician can control a drone from below, which transmits the images and evaluates the data independently. It automatically measures and maintains the correct distance and notifies the technician of possible abnormalities. The drone steers locally in direct communication with the technician, who only has to make a visual inspection at dizzying heights in case of deviations.

A second outside the box application is the optimization of a flow of goods and logistics of a company based on airborne surveillance. Drone data can accurately view and virtually simulate all goods routes, trucking and conveying movements as well as processes of a company from a bird's-eye view. This way, it can be recognized that, for example, the delivery trucks arrive at the ramp too early, thus causing a jam in the supply chain. With the knowledge of the drones, the in-house logistics can be made highly efficient.

One of the most recent and prominent examples of the use of 3D technology in conjunction with Artificial Intelligence is Amazon pilot supermarket GO. Customers do not need cash there and do not have to pay at any checkout; they just go in, load the products they want and go out with a full shopping cart. The market is fully camera-monitored and recognizes which goods a customer has placed in his car. Currently the market is open for employees of Amazon, it recognizes the customers by face recognition and charges directly to the deposited credit card. Intelligent cameras register the facial expression of the shopping people so an employee can offer his help when the algorithm captures a questioning look. Based on this data, Amazon can analyze customer behavior, reactions to products as well as run a decision-making process very closely and draw profit and turnover-increasing conclusions. In addition to industrial and commercial applications, there are also

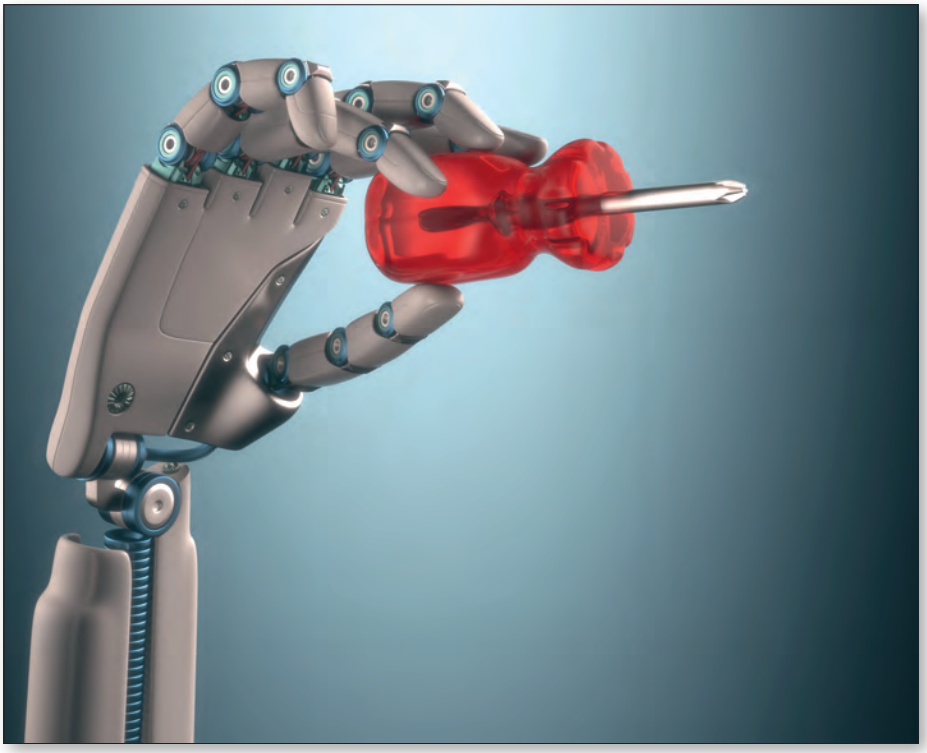


Figure 2. Exact control of robot arms by 3D and AI will allow cooperative work with human beings.

purely humanitarian applications, such as intelligent 3D glasses for the support of the visually impaired in everyday life. The glasses are equipped with the latest stereo cameras, where intelligent algorithms translate the visual signals into haptic and acoustic information. The visually impaired person is read street names, tram lines or signs at shops, as the audio information is based on the recognition of forms, objects and fonts. Positions and distances are provided as a haptic feedback on a belt equipped with vibrating motors. Depending on where an obstacle is, it vibrates in another place on the arm. The visually impaired user learns a kind of perception that enables him to fully understand his surroundings and to orient himself. The next level of image processing has already begun. Applications that use a combination of 3D technology and artificial intelligence have long since found their way into everyday industrial and social life. In the near future, these applications and those that humanity still cannot imagine today will describe a new normality. What happened with the light bulb around 150 years ago could also apply to the potential of image processing and artificial intelligence - at some point, industry and humans will no longer be able to imagine how it went without it. ■

Product News

■ Socionext implements AV1 encoder on FPGA over cloud service

Socionext has developed a prototype implementation of video encoder functionalities of the latest video compression format AV1 onto Amazon Elastic Compute Cloud (Amazon EC2)F1 Instance. Utilizing F1, Socionext was able to complete the development and achieved high performance in just one and a half months. Based on this result, Socionext will explore the possibility of new, service-oriented products that allow customers to use functions of semiconductor devices through cloud services, and to provide users with other accelerators built on the cloud to boost the productivity of large-scale, high-performance cloud-based applications.

News ID 6316

■ Farnell: end-to-end Sub-1 GHz kit for easy cloud connectivity

Farnell element14 announces availability of the element14 development kit for the TI SimpleLink Sub-1 GHz Sensor to Cloud Linux Gateway based on technology from Texas Instruments. The kit provides an end-to-end tool to enable a Sub-1 GHz sensor network with an Internet of Things (IoT) gateway and cloud connectivity.

News ID 6222

■ Lattice: IP core support for iCE40 UltraPlus family

Lattice Semiconductor released its new FPGA software, Lattice Radiant, targeted for the development of broad market low power embedded applications. With its rich feature set and ease-of-use, Lattice Radiant software's support for iCE40 UltraPlus FPGAs greatly expands the device's application across broad market segments including mobile, consumer, industrial, and automotive. iCE40 UltraPlus devices are the world's smallest FPGAs with enhanced memory and DSPs to enable always on, distributed processing. The Lattice Radiant software is now available for download, free of charge.

News ID 6080

■ Toshiba releases new three-phase brushless fan motor driver IC

Toshiba launch the TC78B025FTG, a three-phase brushless motor driver IC with a rotation speed control (closed loop control) function. The new device is intended for small fan applications in servers, home appliances and industrial equipment. The cooling fans used in servers and other must be small and rotate at high speeds with uniform accuracy.

News ID 6289

■ Würth: control plant growth selectively with artificial light

Würth Elektronik eiSos presents WL-SMDC – the new mono-color ceramic LEDs for SMT assembly – optimally tailored to requirements in artificially illuminated greenhouses. Besides manufacturing products in the common colors of blue, yellow, green and red, these LEDs are also available in the wavelengths 450 nm (Deep Blue), 660 nm (Hyper Red) and 730 nm (Far Red). The emissions spectra of these horticulture LEDs correlates optimally with the absorption spectra of plant photosynthesis pigments.

News ID 6209

■ Bridgtek: EVE graphics controllers with ASTC functionality

Further extending its multi-award winning embedded video engine (EVE) product offering, Bridgetek has now introduced the BT815/6 series of highly advanced graphic controller ICs for next generation human machine interface development. Support for the Adaptive Scalable Texture Compression (ASTC) algorithm means that image quality can be significantly enhanced without needing greater bandwidth to be allocated as the compression algorithm allows for smaller compressed files. Thanks to this, these new EVE devices have the ability to enable major savings in memory space required when it comes to larger fonts and data-heavy images.

News ID 6079

■ Microchip introduces MPLAB PICkit 4 programming and debugging development tool

The debugging process remains an important area where many embedded design engineers would like to see improvements, according to AspenCore's 2017 Embedded Market Study. To address these needs and enhance the development experience, Microchip introduces the MPLAB PICkit 4 In-Circuit Debugger. The low-cost PICkit 4 in-circuit programming and debugging development tool is meant to replace the popular PICkit 3 programmer by offering five times faster programming, a wider voltage range (1.2-5V), improved USB connectivity and more debugging interface options.

News ID 6082

■ Mouser: global distribution partnership with Advanced Energy Industries

Mouser Electronics announces a global distribution partnership with Advanced Energy Industries (AE), a global leader in precision power conversion. Through the agreement, Mouser will stock AE's power portfolio, including high-voltage and thermal products.

News ID 6274

Analog sampling: what do accuracy, sensitivity, precision, and noise mean?

By Kathrin Huber, National Instruments

■ When referring a sample for quality testing, you want to evaluate the accuracy and precision of your measurement. However, it is important to understand your oscilloscope's sensitivity first. Sensitivity is the smallest change in an input signal that can cause the measuring device to respond. In other words, if an input signal changes by a certain amount - by a certain sensitivity - then you can see a change in the digital data. Do not confuse sensitivity with resolution and code width. The resolution defines the code width; this is the discrete level at which the instrument displays values. However, the sensitivity defines the change in voltage needed for the instrument to register a change in value. For example, an instrument with a measurement range of 10V may be able to detect signals with 1mV resolution, but the smallest detectable voltage it can measure may be 15mV. In this case, the instrument has a resolution of 1mV but a sensitivity of 15mV.

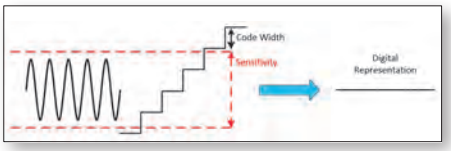


Figure 1. Sensitivity that is greater than the code width can help smooth out a noisy signal.

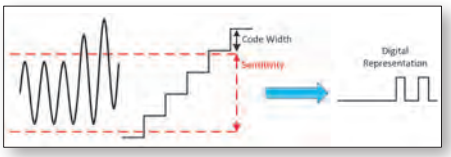


Figure 2. Once the signal crosses the sensitivity level, it is represented by a different digital value.

$$\text{Vertical Accuracy} = \pm(\text{DC Gain Accuracy} + \text{DC Vertical Offset Accuracy} + \%\ \text{Full Scale})$$
$$\text{Vertical Accuracy} = \pm(\%\ \text{of Input at}\ \%\ \text{of Range})$$

Figure 3. Calculating the vertical accuracy of an oscilloscope

$$\text{Accuracy} = (\%\ \text{of Reading}) + \text{Offset}$$
$$\text{Accuracy} = (\%\ \text{of Reading}) + (\%\ \text{of Range})$$
$$\text{Accuracy} = \pm\,(\text{ppm of Reading} + \text{ppm of Range})$$

Figure 4. Calculating the vertical accuracy of a DMM or power supply

In some cases, the sensitivity is greater than the code width. At first, this may seem counterintuitive - doesn't this mean that the voltage changes by an amount that can be displayed and yet not be registered? Yes! To understand the benefit, think about a constant DC voltage. Although it would be great if that voltage was really exactly constant with no deviations, there is always some slight variation in a signal, which is represented in figure 1. The sensitivity is denoted with red lines, and the code width is depicted as well. In this example, because the voltage is never going above the sensitivity level, it is represented by the same digital value - even though it is greater than the code width. This is beneficial in that it does not pick up noise and more accurately represents the signal as a constant voltage. Once the signal actually starts to rise, it crosses the sensitivity level and then is represented by a different digital value, as in figure 2.

Keep in mind that your measurement can never be more accurate than the sensitivity. There is also some ambiguity in how the sensitivity of an instrument is defined. At times, it can be defined as a constant amount as in the example. In this case, as soon as the input signal crosses the sensitivity level, the signal is represented by a different digital value. However, sometimes it is defined as a change in signal. After the signal has changed by the sensitivity amount specified, it is represented by a different signal. In this case, it is not the absolute voltage that matters, but rather the change in voltage. In addition, some instruments define the sensitivity as around zero.

Not only does the exact definition of the term sensitivity change from company to company, but different products at the same company may use it to mean something slightly different as well. It is important that you check your instrument specifications to see how sensitivity is defined; if it is not well-documented, contact the company for clarification. Accuracy is defined as a measure of the capability of the instrument to faithfully indicate the value of the measured signal. This term is not related to resolution; however, the accuracy can never be better than the instrument resolution. Depending on the instrument or digitizer, there are different expectations for accuracy. For instance, in general, a digital multimeter (DMM) is expected to have higher accuracy than an oscilloscope. How accuracy is calculated also changes by device; always check your instrument specifications to see how your particular instrument calculates accuracy.

Oscilloscopes define the accuracy of the horizontal and vertical system separately. The horizontal system refers to the time scale or the X axis; the horizontal system accuracy is the accuracy of the time base. The vertical system is the measured voltage or the Y axis; the vertical system accuracy is the gain and offset accuracy. Typically, the vertical system accuracy is more important than the horizontal one. The vertical accuracy is typically expressed as a percentage of the input signal and a percentage of the full scale. Some specifications break down the input signal into the vertical gain and offset accuracy. Figure 3 shows two different ways in which the accuracy might be defined. For example, an oscilloscope can define the vertical accuracy in the following manner:

Vertical Accuracy = ±2% of Input, ±1% Full Scale

With a 10V input signal and using the 20V range, you can then calculate the accuracy:

Vertical Accuracy = ±(2% of Input + 1% Full Scale)

Vertical Accuracy = ±(0.02 * 10 + .01 * 20) = ±0.4V

DMMs and power supplies usually specify accuracy as a percentage of the reading. Figure 4 shows three different ways of expressing the accuracy of a DMM or power supply.

The term ppm means parts per million. Most specifications also have multiple tables for determining accuracy. The accuracy depends on the type of measurement, the range, and the time since last calibration. Check your specifications to see how accuracy is calculated. As an example, a DMM is set to the 10V range and is operating 90 days after calibration at 23°C ±5°C, and is expecting a 7V

signal. The accuracy specifications for these conditions state ±(20 ppm of reading + 6 ppm of range). You can then calculate the accuracy:

$$Accuracy = \pm\,(20\ ppm\ of\ Reading + 6\ ppm\ of\ Range)$$
$$Accuracy = \pm\,(ppm\ of\ 7\ V + 6\ ppm\ of\ 10\ V)$$
$$Accuracy = \pm\left(\frac{20}{1{,}000{,}000} * 7 + \frac{6}{1{,}000{,}000} * 10\right)$$
$$Accuracy = 0.0002\ V = 200\ \mu V$$

In this case, the reading should be within 200 µV of the actual input voltage. DAQ cards often define accuracy as the deviation from an ideal transfer function. Figure 5 shows an example of how a DAQ card might specify the accuracy. It then defines the individual terms: gain eror = residual AI gain error + (gain temperature coefficient * temperature change from last internal calibration) + (reference temperature coefficient * temperature change from last external calibration). Offset error = residual AI offset error + (offset temperature coefficient * temperature change from last internal calibration + INL error).

$$Accuracy = (Reading * Gain\ Error) + (Reading * Offset\ Error) + (Noise\ Uncertainty)$$

Figure 5. Calculating the accuracy of a DAQ device

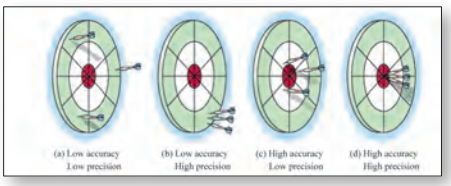


Figure 6. Precision and accuracy are related but not the same.

$$Precision = 1 - \frac{|Offset\ From\ Input\ Signal|}{|Input\ Signal|}$$

Figure 7. Calculating precision

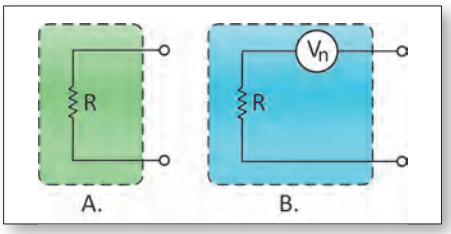


Figure 8. An ideal resistor is reflected in A, but, practically, resistors have internal thermal noise as represented in B.

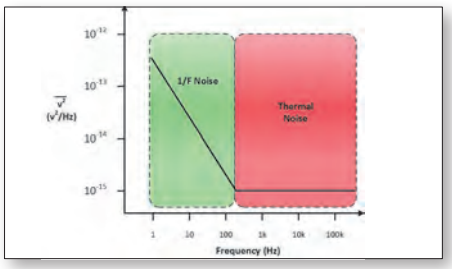


Figure 9. Most likely source of noise

The majority of these terms are defined in a table and based on the nominal range. The specifications also define the calculation for noise uncertainty. Noise uncertainty is the uncertainty of the measurement because of the effect of noise in the measurement and is factored into determining the accuracy. In addition, there may be multiple accuracy tables for your device, depending on if you are looking for the accuracy of analog in or analog out or if a filter is enabled or disabled.

Accuracy and precision are often used interchangeably, but there is a subtle difference. Precision is defined as a measure of the stability of the instrument and its capability of resulting in the same measurement over and over again for the same input signal. Whereas accuracy refers to how closely a measured value is to the actual value, precision refers to how closely individual, repeated measurements agree with each other. Precision is most affected by noise and short-term drift on the instrument. The precision of an instrument is often not provided directly, but it must be inferred from other specifications such as the transfer ratio specification, noise, and temperature drift. However, if you have a series of measurements, you can calculate the precision.

For instance, if you are monitoring a constant voltage of 1V, and you notice that your measured value changes by 20µV between measurements, then your measurement precision can be calculated as follows.

$$Precision = 1 - \frac{|20\ \mu V|}{|1\ V|} = 1 - \frac{|20|}{|1{,}000{,}000|} = 0.99998$$

Typically, precision is expressed as a percentage. In this example, the precision is 99.998 percent. Precision is meaningful primarily when relative measurements (relative to a previous reading of the same value), such as device calibration, need to be taken.

Do not confuse sensitivity with resolution and code width. The resolution defines the code width; this is the discrete level at which the instrument displays values. However, the sensitivity defines the change in voltage needed for the instrument to register a change in value. For example, an instrument with a measurement range of 10V may be able to detect signals with 1mV resolution, but the smallest detectable voltage it can measure may be 15mV. In this case, the instrument has a resolution of 1mV but a sensitivity of 15mV.

An ideal electronic circuit produces no noise of its own, so the output signal from the ideal circuit contains only the noise that was in the original signal. But real electronic circuits and components do produce a certain level of inherent noise of their own. Even the simple fixed-value resistor is noisy. Figure 8A shows the equivalent circuit for an ideal, noise-free resistor. The inherent noise is represented in figure 8B by a noise voltage source Vn in series with the ideal, noise-free resistance Ri. At any temperature above absolute zero (0K or about -273°C), electrons in any material are in constant random motion. Because of the inherent randomness of that motion, however, there is no detectable current in any one direction. In other words, electron drift in any single direction is cancelled over short time periods by equal drift in the opposite direction.

Electron motions are therefore statistically decorrelated. There is, however, a continuous series of random current pulses generated in the material, and those pulses are seen by the outside world as a noise signal. This signal is called by several names: Johnson noise, thermal agitation noise, or thermal noise. This noise increases with temperature and resistance, but as a square root function. This means you have to quadruple the resistance to double the noise of that resistor.

Semiconductor devices tend to have noise that is not flat with frequency. It rises at the low end. This is called noise, pink noise, excess noise, or flicker noise. This type of noise also occurs in many physical systems other than electrical. Examples are proteins, reaction times of cognitive processes, and even earthquake activity. Figure 9 shows the most likely source of the noise, depending on the frequency the noise occurs for a particular voltage; knowing the cause of the noise goes a long way in reducing the noise.

Although noise is a serious problem for the designer, especially when low signal levels are present, a number of common sense approaches can minimize the effects of noise on a system. Here are some strategies to help reduce noise. Keep the source resistance and the amplifier input resistance as low as possible. Using high value resistances increases thermal noise proportionally. Total thermal noise is also a function of the bandwidth of the circuit. Therefore, reducing the bandwidth of the circuit to a minimum also minimizes noise. But this job must be done mindfully because signals have a Fourier spectrum that must be preserved for accurate measurement. The solution is to match the bandwidth to the frequency response required for the input signal. Prevent external noise from affecting the performance of the system by appropriate use of grounding, shielding, cabling, careful physical placement of wires, and filtering. Then use a low-noise amplifier in the input stage of the system and for some semiconductor circuits, use the lowest DC power supply potential that does the job. ■

■ DATA MODUL: automotive level 7" TFT for portable, mobile outdoor use

At Ortustech, it's not just the TFT portfolio which is continuing to grow, but the panels themselves which are also growing in size. As of now, the high-resolution (800 x 480 dots) COM70H7M24ULC, a 7" TFT panel in landscape mode, is available as part of the product line. The display is equipped with Blanview 2 technology, which particularly proves its worth in sunlight-intensive outdoor use. Even at 7", the readability remains unabatedly good, even in critical environmental conditions.

News ID 6272

■ Vecow: Coffee Lake based workstation-grade fanless Embedded system

Vecow launches her latest workstation-grade embedded system with 8th Generation Intel Coffee Lake platform, ECX-1000 Series Fanless Embedded System. Powered by the latest 8th generation 6 cores Intel Core i7/i5/i3 processor (Coffee Lake-S), fanless -40 to 75°C operating temperature, multiple 10GigE RJ45/SFP+ Fiber LAN, max 6 USB 3.1 connections supporting up to 10Gbps data rate, outstanding system performance, WiFi/4G/3G/LTE/GPRS/UMTS mobile availability, user-friendly with smart manageability, 6 to 36V power input with 80V surge protection, ignition power control, smart circus protection and rugged reliability in harsh environments, all-in-one integrated features,

News ID 6207

■ Trinamic: complete EtherCAT slave controllers optimized for real-time

TRINAMIC Motion Control extends its portfolio of dedicated EtherCAT slave controller ICs with integrated motor control peripherals. The TMC8461 and TMC8462 are the world's first EtherCAT slave controllers with high voltage I/Os capable of 24V and two integrated switching regulators. The TMC8462 additionally has two integrated Ethernet PHYs for minimized board space. Both ICs eliminate latency by incorporating PWM and Step/Dir I/O peripherals that make routing through the firmware of an application processor redundant, making it ideal for Industrial IoT, automation and other applications requiring real-time response.

News ID 6225

■ b-plus: lossless decoupling of raw data with time-stamps

Along with increasing sensor data rates (e.g. camera and radar data), the challenges of loss-free acquisition of raw data are also rising. The b-plus solution MDILink is located on the sensor end and enables lossless decoupling of raw data with time-stamps from e.g. a serial link/LVDS camera interface.

News ID 6104

■ Portwell supports UIC standard

Portwell announces broad support for the Universal IoT Connector (UIC), introduced by SGET. The SGET-defined software interface serves as a universal docking point for cloud services to embedded hardware. Portwell is one of the initiators of the SGET standardization group, which accelerated the definition of the standard. In order to guarantee rapid market penetration, Portwell supports the launch of the UIC with its comprehensive portfolio of modules, boards and systems.

News ID 6089

■ Cincoze: sunlight readable Panel PC and touch monitor for outdoor applications

Cincoze to announce sunlight readable panel PC and touch monitor "CS-100 Series". The product series incorporates an ultra high brightness backlight module up to 1,600 nits which provides superior readability under a high-ambient light condition and even direct sunlight. CS-100 Series also supports wide range operating temperature (max. range: -20°C ~ 70°C) to ensure stability and reliability of the system in outdoor environments.

News ID 6117

■ Lanner introduces V3 series of fanless, rugged vehicle gateway controllers

Lanner Electronics launches next-generation rugged, fanless V3 Series vehicle gateway controllers – V3G and V3S. While V3G is targeted for smart bus implementation, including fleet management and passenger information display, V3S aims at video surveillance, recording and analytics. The V3 series gateways can operate under wide temperature range (-40~70°C), indicating their excellent reliability in harsh environment.

News ID 6298

■ Kontron: COM Express Type 6 module with 8th Gen Intel Core/ Xeon E processors

Kontron announces the new COMe-bCL6 in the COM Express basic Type 6 form factor (125x95 mm). It is based on processors of the latest 8th Gen Intel Core/ Xeon E family with a mobile chipset (CM246/QM370 PCH). The COMe-bCL6 offers highest industry-grade quality and allows for flexible application scenarios.

News ID 6229

■ SECO: COMe-C08-BT6 with up to six cores at up to 4.7 GHz

SECO presents its latest product based on the brand-new Intel 8th generation Core/Xeon CPUs, unveiled just today, April 3rd, 2018, by Intel: COMe-C08-BT6. The launch is taking place at the same time with the launch of Intel 8th generation Core/Xeon, since SECO is part of the early access program.

News ID 6167

■ Pentair: PXIe system offers high data transmission rates for test and measurement signals

Pentair is expanding its product range with a modular PXI Express system for test and measurement applications. As with all Schroff products, the off-the-shelf component options ensure flexibility and cost-efficient adaptation of numerous customer or application requirements. PXI Express offers a modular architecture, combining the PCI Express bus with the CompactPCI Express form factor for a wide range of PC-based testing and measurement applications.

News ID 6177

■ DATA MODUL: Coffee Lake COM Express module

With the current Intel Core platform, Coffee Lake H (eighth generation), having been officially launched, DATA MODUL can provide customers with samples of the corresponding COM Express Basic Type 6 modules. These reference modules can then be immediately put into production on baseboards, or used for customer-specific single board computers (ODM designs). With the official Intel launch of the new Coffee Lake H platform, a further module will be now available as a building block, directly after Kaby Lake.

News ID 6171

■ ARBOR supplies IoT connected medical computing solutions

Being a global supplier of medical computing solutions, ARBOR's 9.7-inch multi-touch tablet PCs has taken the lead in elderly care and bloodmobile applications as the essential HMI (human machine interface) of the newly developed Internet of things ecosystems in the US and Northeast Asia. Following the successful deployment of the healthcare systems projected by French and Australian hospitals earlier this year, ARBOR further extended their expert experience and solutions to a large US retirement house and the Red Cross in Asia

News ID 6179

■ Lattice: ultra-low power sensAI enablement of AI in edge devices

Lattice Semiconductor unveiled Lattice sensAI – a complete technology stack combining modular hardware kits, neural network IP cores, software tools, reference designs and custom design services – to accelerate integration of machine learning inferencing into broad market IoT applications. With solutions optimized for ultra-low power consumption (under 1 mW–1 W), small package size (5.5 –100 mm²) and interface flexibility (MIPI CSI-2, LVDS, GigE, etc.), Lattice sensAI stack fast-tracks implementation of edge computing close to the source of data.

News ID 6286

Axiomtek: advanced 4-slot modular Industrial PC for factory automation

Axiomtek introduces the IPC964-512-FL, a 4-slot fanless barebone system with modular design and optimized expandability. The rugged industrial PC supports the high-performance 7th/6th generation Intel Core and Celeron processors (codename: Kaby Lake/ Skylake) with the Intel Q170 chipset. It has an I/O module slot and three different types of I/O modules for customers to choose based on their needs. In addition, four PCI/ PCIe slots give even more powerful expansion ability to support add-on cards.

News ID 6249

congatec: SMARC makes digital cockpit designs smarter

congatec and Luxoft introduce a next-gen automotive platform with SMARC 2.0 Computer-on-Modules. Launching with the conga-SA5 as the first official supported module, the Automotive Reference Platform (ARP) co-developed by Intel and Luxoft makes digital cockpit designs of next-generation vehicles smarter. The new platform enables clustering of previously separately managed functions such as head unit display, cockpit occupant monitoring and advanced driver assistance systems.

News ID 6136

Avalue introduces advanced ARC industrial tablet PCs

Avalue Technology's modular and scalable ARC-series 1209/1509 tablet computers are rugged and can be upgraded flexibly, gaining widespread industrial adoption in recent years. Riding on the success of the ARC series, Avalue is introducing an advanced version – the highly scalable and modular ARC-series 1232/1532 tablet computers.

News ID 6115

MACOM: 400Gbps chipset for short reach optical connectivity applications

MACOM Technology Solutions announced the sampling availability of its four channel, 56 Gb/s PAM-4 VCSEL driver (MALD-38435) and companion four channel transimpedance amplifier (TIA) (MATA-38434) devices for short reach VCSEL-based optical module and active optical cables (AOC) applications. These new devices complement previously announced transmit and receive clock data recovery devices for a complete transmit and receive solution. MACOM's chipset solution operates at up to 56 Gb/s PAM-4 (28GBbaud PAM-4) data rate per channel, enabling short reach (up to 100m) optical modules for 200G QSFP and 400G QSFP-DD and OSFP applications. As demand for 100G connectivity progresses to 200G and on to 400G, optical module suppliers are looking to enable Cloud Data Centers and high-performance computing clusters with optical connectivity solutions delivered in a small form factor and consuming low power at low cost. MACOM's fully analog chipset solution, featuring the MALD-38435 driver and MATA-38434 TIA along with MACOM's existing MASC-38040 and MAOM-38051/38053 CDR devices, offers customers that optimal high-performance, low power and low-cost combination.

News ID 6127

Eurotech: ReliaGATE 20-25 achieves SAP-certified integration as built on SAP Cloud Platform

Eurotech's ReliaGATE 20-25 has achieved SAP certification as built on SAP Cloud Platform. The ReliaGATE 20-25 helps organizations to optimize production processes by collecting and managing data in the field and offering advanced remote device management features like predictive maintenance and machine diagnostics.

News ID 6176

MEN: rugged COM Express module with AMD V1000

The CB71C is an ultra-rugged COM Express module for rail, public transportation and industry applications, e.g. data acquisition, infotainment, transcoding and live 3D. It is 100% compatible with COM Express Type 6 Pin-Out and conforms to the VITA 59 standard, which specifies robust mechanics to ensure reliable operation even under the harshest environmental conditions.

News ID 6088

F&S: COM for battery-powered applications with numerous interfaces

F&S Elektronik Systeme introduces a new Computer on Module as part of the efus product family. Efus A53LS is based on a 64 Bit NXP processor, the QorIQ LS1012A Layerscape, with ARM Cortex-A53 core and 800 MHz clock frequency. The CPU is optimized for battery-backed or USB-powered, space-constrained networking and IoT applications.

News ID 6219

SINTRONES: ABOX-5100 series for AI deep learning & virtual reality

SINTRONES announced their new ABOX-5100 series for AI GPU Computer. It is the future of every industry and market because every enterprise needs intelligence. The New ABOX-5100 series can be potentially applied to various fields related to A.I. such as A.I. deep learning & virtual reality in data centers, in the cloud, and on devices which could drive the adoption of industrial automation, intelligent customer experiences, self-driving vehicles and intelligent transportation.

News ID 6231

IBASE: video wall player for UHD multi-screen signage

IBASE Technology debuts its SI-61S ultra-high resolution and highly expandable video wall player developed specifically for multi-screen video wall signage environments. It is equipped with Intel's latest 7th Generation desktop processor and can be integrated with a Matrox, AMD or Nvidia PCI-E (x16) or two PCI-E (x8) graphics cards to play super high-resolution, eye-catching content in different screen layouts in order to captivate and engage consumers.

News ID 6236

AAEON brings industrial-grade reliability to your vending machines

AAEON releases the AIOT-MSSP01 industrial-grade vending controller solution. The AIOT-MSSP01 comprises two connected boards. The main board houses the MCU host, six USB ports and a further internal USB connector. The upper, I/O board handles the majority of the vending functions.

News ID 6293

MEN: new M-module with four serial interfaces

The M-Module M77N has been developed according to the ANSI Mezzanine standard and extends the carrier board by four electrically isolated serial interfaces, which can be adapted to the respective requirements by software. The M-Module M77N supports four high-performance UARTs with RS232 or RS422 / 485 interfaces - implemented in the FPGA.

News ID 6228

Arrow Electronics offers Scalys System-on-Modules

Arrow Electronics has signed an agreement to supply Scalys' System-on-Modules (SoMs) and Small Board Computers (SBC) throughout Europe, Middle East and Africa. Scalys single and multi-core SoMs and boards are small form factor computer boards that can be integrated with ease into many applications, reducing development time significantly.

News ID 6288

Eurotech and e-Lios partner up for a coffee 4.0

Eurotech announces a technical partnership with e-Lios - a company based in Camerino (Macerata, Italy) specialized in software development for small and medium-sized businesses – for a draft study on interconnection and remote control of coffee machines. The partnership has begun within an innovative project involving Simonelli Group, a company based in the Marche region which exports coffee machines worldwide.

News ID 6206

■ SECO announces new UDOO maker board

Two years after the stunning Kickstarter success of UDOO X86 the UDOO Team is back in the game with the UDOO BOLT, an open-source hardware maker board. The UDOO BOLT comes with four video ports - two USB-C and two HDMI 2.0, which, by the way, are FCC- and CE-certified - and, thanks to its jaw-dropping GPU, can stream a video in 4K resolution at 60fps on four screens at the same time.

News ID 6307

■ EKF: PICMG CompactPCI Serial peripheral slot board

EKF presents the SY8-CYCLONE, a CompactPCI Serial peripheral board, equipped with a powerful FPGA, and up to ten RJ45 connectors for 100BASE-TX Industrial Ethernet. With its PCI Express x4 interface, the Cyclone®-V FPGA can be used e.g. as Ethernet NIC, switch, router, or gateway for the IIoT.

News ID 6320

■ ST: free safety-design package for certification of STM32-based IEC 61508 applications

STMicroelectronics is helping technology brands design safer applications, more quickly and cost-effectively, with new software for its successful STM32 microcontrollers. Created for designers of STM32-based devices in the field of industrial controls, robots, sensors, medical, or transportation, which must be certified up to Safety Integrity Level (SIL) 2 or 3 of the recognized safety standard IEC 61508, ST's STM32 SIL Functional-Safety Design Package simplifies system development and certification.

News ID 6239

■ Maxim: low-power MCUs extend battery life for wearables and other compact devices

Designers of IoT sensors, environmental sensors, smartwatches, medical/preventive health wearables, and other size-constrained devices can now increase battery life and functionality using the ultra-low power MAX32660 and MAX32652 microcontrollers from Maxim Integrated Products.

News ID 6172

■ Sensirion: humidity sensor for battery-driven applications

Sensirion presents the new ultra-low power humidity sensor SHTC3 for mobile and battery-driven applications. The SHTC3 is a digital humidity and temperature sensor optimized for battery-driven applications and high-volume consumer electronics. The sensor has been designed to overcome conventional limits in size and power consumption in order to fulfill current and future requirements, and offers an unmatched performance-price ratio. The SHTC3 improves the performance and flexibility of the SHTC1, while maintaining its proven reliability.

News ID 6308

■ Microchip: PIC and AVR MCUs increase system performance in closed-loop control applications

Microchip announces the introduction of new PIC18 Q10 and ATtiny1607 families of 8-bit microcontrollers, featuring multiple intelligent Core Independent Peripherals (CIPs) that simplify development and enable a quick response time to system events. Advancements in the architecture of PIC and AVR MCUs have optimised these devices for implementing closed-loop control, enabling systems to offload the Central Processing Unit to manage more tasks and save power.

News ID 6303

■ Renesas: multiphase PMICs with highest efficiency and smallest footprint

Renesas Electronics announced three programmable power management ICs (PMICs) that offer the highest power efficiency and smallest footprint for application processors in smartphones and tablets: the ISL91302B, ISL91301A, and ISL91301B PMICs. The PMICs also deliver power to artificial intelligence (AI) processors, FPGAs, and industrial microprocessors (MPUs), and they are ideal for powering the supply rails in SSDs, optical transceivers, and a wide range of consumer, industrial and networking devices.

News ID 6226

■ Premier Farnell announce new global franchise with SiTime

Premier Farnell announces a new agreement with SiTime, giving Farnell element14 customers access to SiTime's MEMS-based silicon timing solutions, which offer short lead-times, great features, high performance, low power, small size and high reliability. Over one billion SiTime silicon timing devices are being used today in a broad range of applications from smartphones, tablets and cameras to air transportation and earthquake detection systems. Devices such as mobile phones, fitness trackers and tablets rely on the small size and low power consumption of SiTime products.

News ID 6267

■ Toshiba: evaluation board for three-phase BLDC motor drive ICs

Toshiba Electronics Europe announces a new evaluation board for their TPD420xF series of brushless DC (BLDC) three-phase motor driver ICs to speed up the process of prototyping and developing new motor drive solutions up to 80W including white goods, home devices such as hair dryers as well as coolers for fresh goods in the supermarkets and more.

News ID 6311

■ Socionext develops AI accelerator engine optimized for edge computing

Socionext has developed a new Neural Network Accelerator (NNA) engine, optimized for AI processing on edge computing devices. The compact, low power engine has been designed specifically for deep learning inference processing. When implemented, it can achieve 100x performance boost compared with conventional processors for computer vision processing such as image recognition.

News ID 6271

■ Laird: fully integrated 'Connected Car' platform for the global auto industry

With the global connected car market expected to skyrocket over the next five years, Laird is launching the auto industry's first fully integrated and scalable module for secure mobile connectivity and automotive ethernet for reliable Internet use inside and outside the vehicle, the company announced today.

News ID 6265

■ RECOM: long operation lifetime through single AA battery for SensorTile module

RECOM has released a breakout board to connect the SensorTile from STMicroelectronics to RECOM's R-78S evaluation board. This technology enables the SensorTile to draw a stable 3.3V from a AA battery down to voltages as low as 0.65V. Engineers can therefore integrate a high-capacity single-cell AA battery into their designs and use test points to estimate the application's operation lifetime.

News ID 6199

■ Renesas: MCU using advanced 28nm Embedded Flash technology

Renesas announced the sample shipment of the industry's first on-chip flash memory microcontroller using a 28 nm process technology. To contribute to the realization of next-generation green cars and autonomous vehicles with higher efficiency and higher reliability, the revolutionary RH850/E2x Series MCU incorporates up to six 400 MHz CPU cores, which makes it the first on-chip flash memory automotive MCU to achieve the industry's highest processing performance of 9600 MIPS.

News ID 6159

■ Würth and Infineon present wireless power development system 200-W-WPT

Under the name 760308EMP-WPT-200W, Würth Elektronik and Infineon are offering a 200-watt development system for wireless power transfer. What makes the development kit special is that the link between the transmitter and receiver coils can be used to transfer not only power but also data.

News ID 6144

Xilinx unveils adaptable computing product category

Xilinx announced a new breakthrough product category called Adaptive Compute Acceleration Platform (ACAP) that goes far beyond the capabilities of an FPGA. An ACAP is a highly integrated multi-core heterogeneous compute platform that can be changed at the hardware level to adapt to the needs of a wide range of applications and workloads. An ACAP's adaptability, which can be done dynamically during operation, delivers levels of performance and performance per-watt that is unmatched by CPUs or GPUs.

News ID 6143

ROHM: highly integrated PMIC optimized for NXP i.MX 8M applications processor

ROHM announced the availability of a programmable system power management IC (PMIC) optimized for NXP's i.MX 8M family of applications processors that excels in processing audio, video, and graphics in a wide range of applications, from home audio/video to industrial automation and mobile computing. BD71837MWV integrates all power rails required by i.MX 8M processors and system peripherals.

News ID 6296

Green Hills: INTEGRITY-178 tuMP certified as conforming to FACE standard

Green Hills Software has successfully completed the FACE verification process for the Intel version of its INTEGRITY-178 Time-Variant Unified Multi Processing (tuMP) operating system. CERTON, a Cyient Company and independent FACE Consortium approved Verification Authority, has officially verified conformance with the Technical Standard for Future Airborne Capability Environment (FACE) edition 2.1.1, making Green Hills Software the only supplier with a FACE-conformant operating system for Intel architectures. The FACE Registry's inclusion of a UoC for the Intel version of INTEGRITY-178 tuMP demonstrates full completion of the FACE conformance activities for this Green Hills Software product.

News ID 6237

dSPACE supports AUTOSAR 4.3 features

dSPACE is one of the first embedded software development tool providers to support comprehensive functionality for the development and validation of some of the latest AUTOSAR 4.3 features in its products. Technologies that have posed a challenge for many developers, such as secure onboard communication (SecOC), global time synchronization (GTS), and enhanced end-to-end (E2E) protection, can now be developed and tested directly with dSPACE's well-established tools.

News ID 6313

ETAS: collecting measurement data for automated vehicle systems

To develop and test the advanced systems involved in vehicle automation, huge quantities of data need to be collected at high rates. ETAS has joined forces with partners to develop a vehicle-specific solution. Smart systems that automate driving, connect vehicles, and further mitigate their impact on the environment are opening up a new class of vehicle. In the case of vehicle automation, this calls for exact monitoring of driving and environmental conditions, achieved by powerful sensors, image processing, and object recognition systems.

News ID 6111

Interface Concept: XeonD-15xx processor-based 6U VPX DSP board

Interface Concept unveils the IC-INT-VPX6e, a Server Class Digital Signal Processing board, based on two Intel Xeon D-15xx processors (12-core version), in a 6U VPX form factor. The IC-INT-VPX6e combines unmatched performance at low power with the Intel Xeon 14nm SoC package, together with up to 64GB high-speed DDR4 memory. This new IC-INT-VPX6e board represents a real enhanced dual Intel processor-based design, ideal for use in systems deployed in compute-intensive and defense applications.

News ID 6097

ALLDAQ: USB 3.0 SuperSpeed isolator for industry and audio

ALLDAQ presents USB 3.0 isolators supporting the full USB 3.0 SuperSpeed data rate of 5 Gigabit/s. The new re-clocking technology guarantees a stable USB connection for all speeds. With it also USB 3.0 SuperSpeed devices can be electrically isolated from the host PC at full performance. The isolators can be universally used for electrical isolation of USB measurement instruments, to avoid ground loops in industry and automotive area as well as in professional studio and event technology e. g. for streaming of numerous audio tracks via USB audio interfaces.

News ID 6126

ST: new SDK makes motor-control design faster and easier

STMicroelectronics has further simplified development of advanced, energy-efficient motor drives on STM32 microcontrollers by harmonizing the latest STM32 PMSM FOC Software Development Kit with the STM32Cube ecosystem. The move extends opportunities for engineers to build sophisticated drives for equipment such as air conditioners, home appliances, drones, building automation, industrial machinery, medical devices, e-bikes, and many others, without needing specialized experience.

News ID 6133

boards & solutions ECE

Editors
Jürgen Hübner
phone +49(0)8092-2477413
fax +49(0)8092-2477429
jh@iccmedia.com

Wolfgang Patelay
wp@iccmedia.com

Tony Devereux
tony.devereux@tiscali.co.uk

For Reader Inquiries and Address Changes **please contact:**
info@iccmedia.com

Sales & Marketing Director
Manfred Blumoser
phone +49(0)8092-2477411
fax +49(0)8092-2477429
mb@iccmedia.com

Claudia Mellein
cm@iccmedia.com

Christiane Lockner
cl@iccmedia.com

Sales Office - UK and USA, Benelux, Scandinavia
Blue Sky Communications
Malcolm Cameron
21 Cliffe Avenue
Westbrook,
Margate, Kent CT9 5DU, UK
phone +44 (0)77 88-10 84 11
fax +44 (0)80 82-8010 57
mc@blue-sky-communications.com

Sales Office - Asia
Jean Cheng, *jean@i-media.com.tw*
Vivian Hung, *vivian@i-media.com.tw*
Innovative Media Information & Services
7F-3, No. 26, Sec. 2, Ming-Quan East Rd.
Taipei 104 Taiwan
phone +886 2 2563 1186

Head Office
ICC Media

ICC Media GmbH
Rauwagnerstr. 5
85560 Ebersberg / Germany

Editorial Office UK
36a Blackacre Road
Theydon Bois
Essex, CM16 7LU

■ Ikalogic wants to lead the way in T&M ergonomics

Three years ago, Ikalogic undertook an exciting change in company strategy, focusing mainly on the ergonomics of test & measurement instruments and setting a clear goal: Lead the way and set new standards to T&M ergonomics. "How comes an oscilloscope's interface almost didn't change in 5 decades?" is the question that kept pushing Ikalogic team to bring better UX (user experience) to this industry.

News ID 6109

■ SEGGER expands Embedded Studio PRO by adding IoT and security components

SEGGER expands the scope of the Embedded Studio PRO software package by adding IoT security and connectivity related software modules to the package. The newly added modules are SEGGER's IoT Toolkit, the security libraries emSSL, emSSH, emSecure and emCrypt as well as the communication stack emModbus and the compression algorithms emCompress.

News ID 6319

■ Cypress: unified software suite to accelerate IoT product designs

Cypress announced a unified software tool suite that streamlines product designs for the Internet of Things. The new ModusToolbox suite delivers the rich design resources of Cypress' WICED IoT connectivity libraries and the analog and digital peripherals libraries of its PSoC microcontrollers within the familiar, widely-deployed open-source Eclipse Integrated Design Environments.

News ID 6075

■ Parasoft: support for microservice-specific protocols and message formats

Parasoft released new versions of its functional solutions for microservices. Parasoft SOAtest, an API/web/mobile/database testing solution, now provides a simplified approach to testing microservices, with new workflows and protocol support. Parasoft Virtualize, a service virtualization solution, has been bolstered with new technology to help isolate individual components and stabilize test environments.

News ID 6204

■ Mentor: free schematic symbols, PCB footprints and 3D Models for PartQuest

Mentor Graphics has partnered with SamacSys to provide free PCB symbols, footprints and 3D models from within PartQuest, Mentor's online platform for finding component information. The SamacSys CAD library content saves companies the time-consuming task of library part creation.

News ID 6198

■ Cadence and NI collaborate to simplify next-generation semiconductor and RF development

Cadence Design Systems and NI announce a broad-ranging collaboration to improve the overall semiconductor development and test process of next-generation wireless, automotive and mobile integrated circuits and modules. To meet customers' needs for a streamlined and comprehensive solution, Cadence and NI have pursued projects that integrate key design tool technologies into a common user environment.

News ID 6290

■ LieberLieber Software: HIMA meets tough standards with LemonTree

HIMA has used of Enterprise Architect since 2012. It was during a training course that HIMA became aware of LemonTree and recognized the great potential it holds for the versioning of EA models. Before long, a joint effort had been mounted to develop specific enhancements to LemonTree in order to satisfy HIMA's stringent requirements on "smart safety". Since development must always comply with functional safety requirements, precise traceability in the versioning of the models is an essential criterion.

News ID 6156

■ Teledyne LeCroy: WaveSurfer 3000z oscilloscopes with bandwidths from 100 MHz to 1 GHz

Teledyne LeCroy announced the WaveSurfer 3000z oscilloscopes, which expand the existing WaveSurfer 3000 bandwidth range above and below that of earlier models, while also bolstering functionality for power-electronics testing. In addition, the new models provide more processing power and memory. All WaveSurfer 3000z oscilloscopes feature a large 10.1" capacitive touch screen, a vast set of debug and analysis tools, multi-instrument capabilities, feature/option upgrades, and support for a wider probe range.

News ID 6187

■ Arrow: IoT board boosts colour-HMI development for smart sensors and gateways

The HANI (HMI Arrow NXP IoT) development board from Arrow Electronics is designed for IoT node applications where more sophisticated user interfaces are required. It combines support for up to 7-inch colour displays, multi-protocol wireless connectivity, and a rich set of sensors for smart, connected devices that allow simple, direct user interaction including gesture control. The board is well suited for developing gateways or smart sensors for consumer, industrial or medical use cases.

News ID 6248

■ Rohde & Schwarz: FPC entry-level spectrum analyzer combines three key RF test instruments

Rohde & Schwarz has extended its R&S FPC spectrum analyzer family, adding the R&S FPC1500. The R&S FPC1500 is the world's first spectrum analyzer to include a one-port vector network analyzer with internal VSWR bridge, an independent CW signal generator and a tracking generator. Outstanding quality and innovation do not have to come with a high price tag.

News ID 6174

■ Cadence: Sigrity PowerDC supports open neutral file format for thermal interoperability

Cadence Design Systems announced that Cadence Sigrity PowerDC technology supports Future Facilities' new open neutral file format, which solves the challenge of sharing design models between different thermal simulation toolsets. The PowerDC technology's adoption of the single, open-model file format streamlines the thermal supply chain, promotes interoperability and data exchange, and enables customers to improve their thermal and electrical designs while also accelerating their schedule.

News ID 6147

Advertisers Index

Wind River: VxWorks 653 on ARM Architecture

Wind River announced that its VxWorks 653 Multi-core Edition is now available on ARM architecture, a move that brings its portfolio of safe and secure platforms to all the major hardware architectures. Tested and validated on the ARM Cortex-A53 (Xilinx UltraScale + MPSoC), this release provides full 64-bit support for both the virtualization layer and unmodified guest operating systems such as VxWorks 7 and Linux. This ispart of Wind River's continuing commitment to an evolving microprocessor technology environment.

News ID 6259

Manhattan Skyline: add modern GUI with high-end graphics and smooth animation to any system

EDT Smart Embedded products enable the user to add a modern GUI with high-end graphics and smooth animation to any system without the overhead of a memory and power-hungry operating system. The controller board is integrated with the display as one compact module. It includes all necessary circuits to control the TFT display module, backlight, PCAP and the GUI application.

News ID 6282

Cadence: analog IC design-for-reliability solution

Cadence Design Systems introduced the Cadence Legato Reliability Solution, the industry's first software product that meets the challenges of designing high-reliability analog and mixed-signal integrated circuits for automotive, medical, industrial, and aerospace and defense applications. The Legato Reliability Solution provides analog designers with the tools they need to manage their design's reliabilitythroughout the product lifecycle, from initial test through active life through aging.

News ID 6255

Arrow: ARIS-EDGE-S3 kit simplifies development of battery-powered applications

Arrow Electronics has extended its convenient and flexible ARIS (Arrow Renesas IoT Synergy) platform for developing IoT devices by introducing the ARIS-EDGE-S3, which packs extra compute performance and the opportunity to add a compact user interface for richer interactions. Teaming the latest Arm Cortex-M4-based 48MHz Renesas Synergy S3A3 Group of microcontrollers with rich context sensing and the multi-protocol wireless subsystem proven in other ARIS-EDGE boards, the new ARIS-EDGE-S3 lets developers add extra sophistication to connected objects.

News ID 6150

Digi-Key: compact power measurement tool for IoT applications from Qoitech

Qoitech has signed a worldwide distribution agreement with Digi-Key Electronics to distribute the Otii solution, a power measurement tool with software. The Otii solution provides developers with the means to simplify power measurement of applications and devices, especially those targeting the IoT space and aiming for optimized, long battery life.

News ID 6132

DDC: compact, high power density BLDC motor controller

Data Device Corporation introduces a high performance DSP based family of programmable, turnkey motor controllers designed to precisely control the position, torque, and speed of 3-phase BLDC motors, with maximum reliability. The high power density 80V/30A rated MC-5000 series BLDC motor controller operates over an extended -40 to +105°C temperature range, and is available in configurations to support motors that utilize a Hall sensor for torque and speed control, or absolute PWM and incremental encoder feedback for position control.

News ID 6243

Express Logic: X-Ware IoT Platform supports AndesCore N25 and NX25 RISC-V processors

Express Logic has announced that its industrial-grade X-Ware IoT Platform—powered by the ThreadX RTOS—provides turnkey support for the AndesCore 32-bit N25 and 64-bit NX25 RISC-V processors. RISC-V, a standard open architecture ISA under the governance of the RISC-V Foundation, is highly portable and enables the open source community to test and improve cores faster than with closed ISAs.

News ID 6263

Express Logic supports Secure Boot and Secure Firmware Update for STM32 MCUs

Express Logic announced that it has integrated the STMicroelectronics' Secure Boot and Secure Firmware Update v.2.0 services with its X-Ware IoT Platform for its developers using the STM32-family of ARM Cortex-M microcontrollers. The X-CUBE-SBSFU Secure Boot and Secure Firmware Update solution enables the update of the STM32 microcontroller built-in program with new firmware versions based on the X-Ware IoT Platform.

News ID 6253

Teledyne LeCroy: WavePro HD oscilloscopes capture every detail up to 8 GHz

Teledyne LeCroy announced the WavePro HD high-definition oscilloscopes, which combine for the first time HD4096 12-bit technology and 8 GHz bandwidth for low noise and pristine signal fidelity. With a maximum of 5 Gpoints of fast, responsive, and easily navigable acquisition memory, also an industry first, WavePro HD oscilloscopes also acquire extremely fine waveform details over long periods of time. A deep, powerful toolset quickly exposes underlying system behaviors.

News ID 6256