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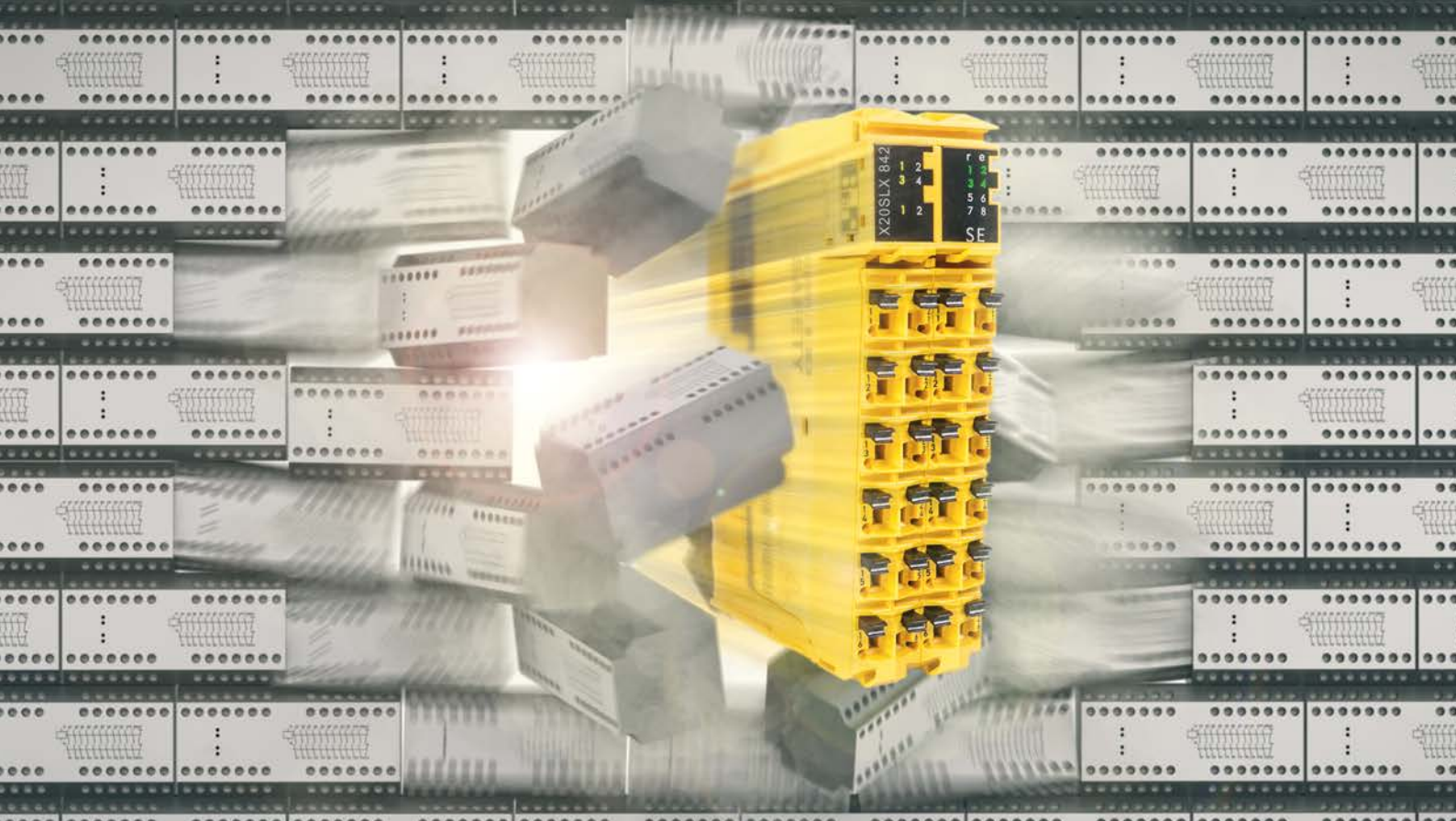


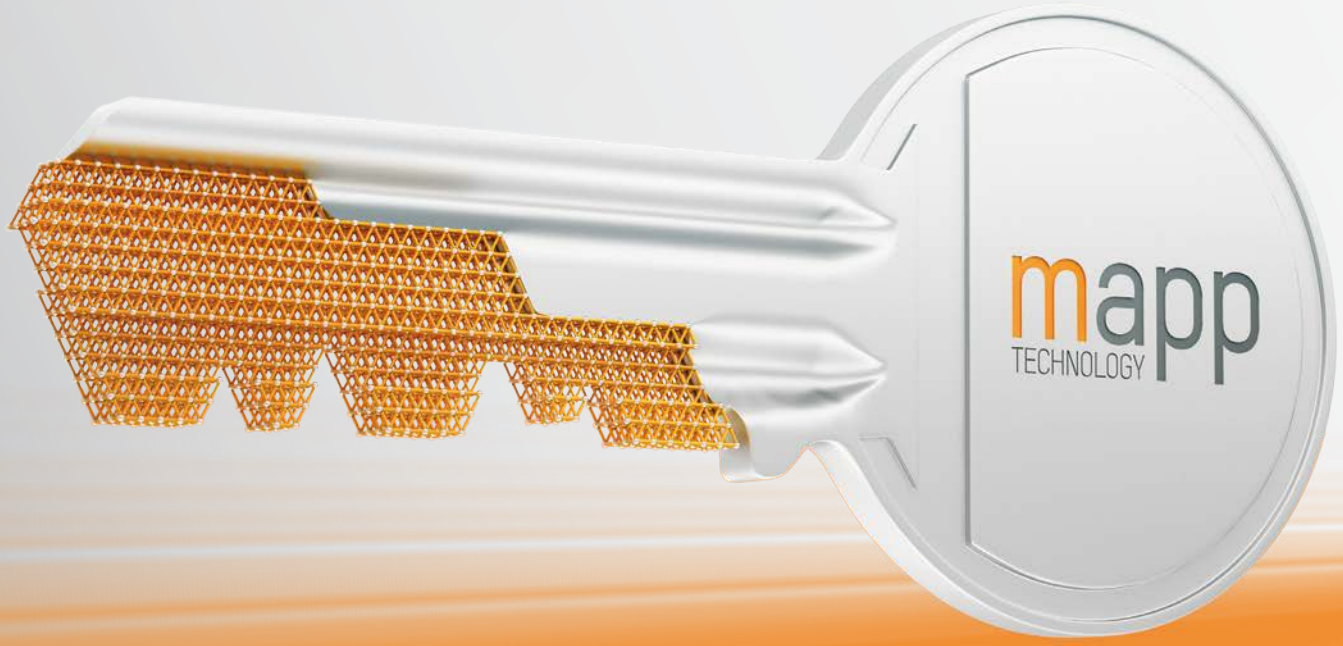
10 years of integrated safety from B&R

"There's so much more to safety than simply shutting down the machine."

Intelligent track systems Flexibility meets cost efficiency

Cybersecurity For controllers with cloud connectivity

PERFECTION IN AUTOMATION
A MEMBER OF THE ABB GROUP



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Dear Reader,

It all started back on June 8, 2004 – the day B&R kicked off its safety technology project. Even at this very first meeting, it was clear that we were working on something big. At the time, B&R was already offering its ACOPOS drive system with a safe restart interlock. B&R's vision for its safety technology, however, also included programmable safety technology and secure communication over the real-time Ethernet POWERLINK. We were able to draw from many concepts that had proven themselves throughout our many years of experience as automation specialists – things like automatic firmware downloads, concepts to support modular machines, cross-controller communication and much more.

These topics in particular provided plenty of material for discussion with the certification institutes, because they were functions that safety technology had not previously offered. Our approach and our understanding of the requirements for safety technology has always been shaped by our background in industrial automation, so our thinking has not been restricted by questions like "What can a safe system do?".

In 2008 – exactly ten years ago – we launched our first product set certified by TÜV Rheinland. Much has happened since, and more importantly: much will continue to happen in the future.

OPC UA is in the starting blocks, and the "Shapers Group" – which includes representatives from nearly every well-known automation supplier – is bringing out the first vendor-neutral standards. What we're looking at just might be the end of the "wars" for dominance in fieldbus, industrial Ethernet and safety layer technology.

As the worlds of functional safety and automation continue to merge into the future, you can look forward to many more safe and innovative years with B&R safety technology.

Happy reading!

Franz Kaufleitner
Product Manager, Integrated Safety Technology

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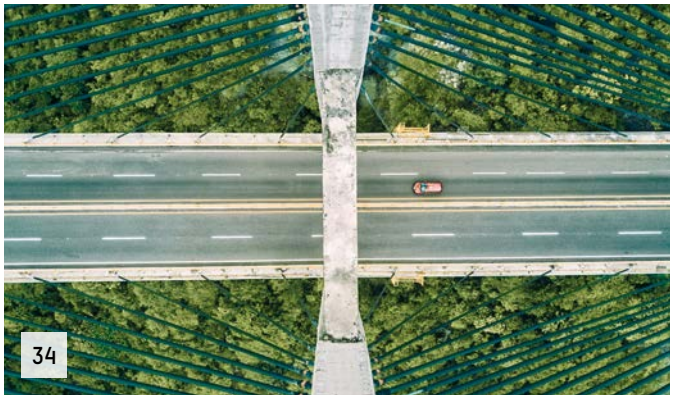


report

news

10 years of integrated safety from B&R

"There is so much more to safety than simply shutting down the machine"

Franz Kaufleitner
Product Manager - Integrated Safety Technology, B&R
"Over the last ten years, we have proven that programmable safety technology has much more to offer than simply shutting down the machine, and we intend to continue exploring its enormous potential."

Photo: B&R

In 2008, B&R unveiled its groundbreaking integrated safety technology. In the decade since, B&R has established itself among the world's preeminent manufacturers of programmable safety technology. Franz Kaufleitner, product manager for integrated safety technology at B&R, explains how his company went from newcomer to trendsetter in the safety industry.

Mr. Kaufleitner, when did B&R decide to begin developing safety technology?
B&R has always taken a holistic approach to system design, so incorporating safety functions into our automation portfolio was a natural progression. At the turn of the millennium, we had already equipped our ACOPOS servo drives with a purely electronic safe torque off function (STO) – a world first that has since been widely adopted throughout the industry. In 2004 came the decision to develop a full scope of integrated safety technology comprising controllers, a programming tool, safe I/O modules and safe drive functions. By the time the safety hype peaked around 2008, we were already able to offer our customers a comprehensive, fully integrated safety solution.

How is B&R safety technology different from other systems?
Safety technology should contribute to the overall automation performance, not be treated as a nuisance or an afterthought. While other safety systems are focused on stopping the machine, we're finding ways to keep production up and running. Our extensive library of safety functions allows users to respond flexibly to safety events. Our safe machine options enable our customers to manage a single safety application that covers the many variants of their modular machines. It's this vast potential of safety technology that has inspired us from the very beginning. There is so much more to safety than simply shutting down the machine.

How has B&R's safety portfolio changed over time?
We laid the foundation in 2008 with a safety controller and I/O modules featuring four safe digital inputs and four safe digital outputs. Ever since, we've been expanding the portfolio in two dimensions. On the one hand, we've introduced revolutionary new functions and products . There's SafeROBOTICS, which offers an extensive array of safety functions for kinematic chains, and DataToSafeDATA, which makes it possible to incorporate standard signals in safety functions. Today, B&R's safety portfolio includes more than 120 different products.

And the other dimension?
We have also been expanding in terms of conformity to meet the needs of different industries and applications. Having started with a focus on traditional machine building, we soon added products with IP67 protection, coated products for harsh environments, and products with newly established certifications, such as DNV GL for maritime and offshore applications. Our safety products can now also be found in wind turbines, theater and stage systems, elevators, plant and process automation systems, steel mills, logistics centers and much more.

When you talk about B&R safety technology, openSAFETY comes to mind – what's new on that front?
openSAFETY is among the three most successful safety protocols worldwide. As an open-source protocol, it has many applications with no direct ties to B&R. An exciting new one is the openSAFETY light curtain from Datalogic. It's a light curtain equipped with a POWERLINK/openSAFETY interface that can be directly integrated into a machine's bus system.

What lies ahead for B&R safety?
The two-dimensional growth will certainly continue. In terms of expanded functionality, we'll be incorporating integrated safety technology into the mapp Technology software framework. This will include out-of-the-box solutions for the safe machine options I mentioned. Since the mapp components talk to each other, the mapp safety functions will be networked with the components for user management, alarms and HMI – without the user ever having to program a single line of code. You can imagine it like this: Because it talks to the user management system, the HMI application knows whether the current user is authorized to switch operating modes, and only displays that option if they are. In terms of expanding the range of applications, the new X90 Safety will bring the benefits of our integrated safety technology to mobile applications: including agricultural equipment, municipal vehicles, excavators and cranes. Whatever the technological frontier, our customers can rest assured that we will always lead the way. A decision for B&R safety technology is a decision for a long-lasting, future-proof solution. Over the last ten years, we have proven that safety technology has much more to offer than simply shutting down the machine, and we intend to continue exploring its enormous potential.

Advanced muting

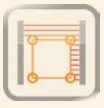
More options, less cost

All of this is made possible by combining advanced muting functions with a network-based openSAFETY light curtain with single-beam evaluation. The light curtain captures an object profile and passes the data on to the SafeLOGIC safety controller from B&R, which evaluates the data and executes safety functions based on the current muting mode.

Because the light curtain beams are evaluated individually, no muting sensors are necessary. All relevant data is transferred by the openSAFETY light curtain. The result is less hardware and easier installation.

Each muting mode is supported by a certified function block that is programmed with the safety controller. The following modes are available:

Small Objects Muting
The function block for small object muting calculates the cross section of the object from its contours. All objects that exhibit a cross section less than that of an average person can pass through the light curtain without triggering a safety reaction. This method can be used for items such as beverage six-packs or luggage.



Box Muting
Box muting detects rectangular-shaped objects and allows them to pass through the light curtain without triggering the safety function. This muting mode is ideal for boxes.

Teach In Muting
Teach-in muting allows users to create object profiles on the fly by scanning an object with the light curtain. The light curtain will then recognize subsequent objects of the same type.

The muting modes available from B&R can be combined to cover virtually any application typically encountered in the field. Due to the many different permitted objects, light curtains with advanced muting provide substantially more flexibility than previous muting methods. For example, long as well as short objects can now be transported through a light curtain. Once installed, no more work is needed, even when switching products. These modes are available as function blocks in the SafeDESIGNER editor for safety applications. The programmer has the choice of using these blocks individually or in combination.

Muting suppresses the safety reaction of a light curtain when certain objects pass through. The advanced muting modes available from B&R offer new, flexible yet inexpensive possibilities in this area. By recognizing multiple product profiles, they now make it possible for objects of different sizes and shapes to pass through a light curtain. The light curtain can be used flexibly for a variety of objects – all while providing full protection for operators. With no need for the usual muting sensors, the solution also reduces installation and hardware costs.

Muting is a light curtain function that suppresses the safety reaction from triggering when certain objects pass through. With conventional light curtains, this is handled by muting sensors located next to the light curtain that capture the size, direction and speed of an object. This data then determines whether muting takes place, i.e. the safety reaction is suppressed, or whether the safety reaction is triggered. Advanced muting from B&R eliminates the need for muting sensors by evaluating the beams of the light curtain individually to capture the necessary data.

Photo: B&R

Intelligent track systems

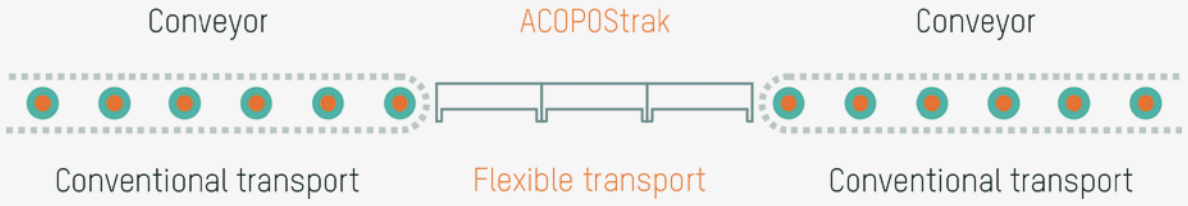
Flexibility meets cost efficiency

Photo: BSR

An intelligent transport system makes mass customization profitable. Personalized products such as custom-mixed smoothies can be produced cost efficiently. Producers are finally free to explore the endless possibilities of product individualization.

This product is not available for sale in the USA until September 2018.

ACOPOStrak
ACOPOStrak is an intelligent transport system featuring fully electronic diverters able to divide and merge product flows at full production speed. Diverters can be used to implement a pit lane that channels new shuttles into the production line while simultaneously collecting any shuttles that are no longer needed. This layout also makes it possible to change over between products with zero downtime. ACOPOStrak's absolute design flexibility allows it to morph into all types of open and closed layouts by arranging different combinations of track segments. The system is capable of 5 g acceleration and reaches top speeds in excess of 4 meters per second with a minimum product pitch of only 50 millimeters. No other transport system on the market offers such impressive performance numbers in combination with high-speed diverters and extensive design flexibility.



ACOPOStrak can be seamlessly integrated into existing conveyor systems.

Many smoothie fans already use the Internet to search for creative new recipes. But then, they resort to the time-consuming and often messy approach of going out and buying the ingredients, taking them home and pureeing them. The faster, easier way to get the ultimate smoothie experience is to order your preferred mix online – say 60% banana, 20% cherry, 10% pineapple and 10% kiwi – and have your custom smoothie delivered straight to your door. And, what if you could also pick the color of the cap and the design on the label? Many experienced producers would call this wishful thinking. After all, until now it has hardly been possible to make personalized products in a way that is profitable.

More flexible manufacturing
In traditional mass production, conveyor belts carry products at fixed intervals and constant speed through a variety of processing stations before they are packaged for sale. "This approach no longer meets the needs of today's consumers," argues Robert Kickinger, mechatronic technologies manager at B&R. The young generation of digital natives enjoy the ability to express their individuality through products tailored to their needs and preferences – and they are willing to pay a premium for them. To address this market and remain competitive, manufacturers are challenged to make their production lines more flexible.

So, how can it be done? One way is to replace conventional conveyor belts with intelligent track-based transport systems. "In some cases, however, it's not necessary to do so for the entire line," says Kickinger. That's why B&R designed its intelligent ACOPOStrak transport system to interact perfectly with conventional conveyor belts. "Many times, all you need to make a personalized product is one short section of flexible, intelligent, track-based transport," says Kickinger. The products can be carried through the rest of the line as usual. Such a hybrid approach combines the flexibility of the intelligent track with the low cost of conventional belts.

Easy hand-off
In some cases, this makes a hybrid solution the most cost-efficient response to the needs of flexible manufacturing. "The key is being able to transfer the products between systems without assistance from an operator or robot," reveals Kickinger. With B&R's solution, this is made possible by the special construction of the shuttles. They are held on the track by magnetic force and on the conveyor belt by friction. Continuous guide rails keep them on the right path.

While the conveyor belt moves the products with constant speed and spacing, each shuttle on the ACOPOStrak segment

Photos: B&R

Guide rails ensure seamless transitions between the conventional conveyor belt and the intelligent ACOPOStrak.

can be controlled independently with a minimum product pitch of 50 millimeters. With the rigid timing of the conveyor belt no longer in effect, batch-of-one personalization can begin. It becomes easy to vary transport speed and processing times at filling, capping and custom labeling stations. Integrating just a short segment of ACOPOStrak into a conveyor system adds the flexibility needed for profitable mass customization. Notes Kickinger proudly: "Producers are finally free to explore the endless possibilities of personalization."

Cost-effective solution also saves space

ACOPOStrak's modular design allows segments of different lengths to be integrated into conventional conveyor systems – "and that includes existing installations," emphasizes Kickinger. For a 100-meter-long production line that only needs 10 meters of intelligent transport, that leaves 90 meters of conventional conveyor.

Each ACOPOStrak segment has an integrated drive assembly. "The power electronics and a powerful processor are built into the motor," explains Kickinger. There is no need for any additional inverters or motion control units, which would not only add substantial cost, but consume a great deal of space in the control cabinet. As a result, the combination of ACOPOStrak and conveyor belts is a very compact, space-saving solution. Kickinger adds: "Hybrid solutions significantly expand the range of potential ACOPOStrak applications." Many lines could benefit from greater flexibility, and achieving it will now be economically feasible. After all: "Just a small dose of intelligence is often all it takes to make batch-of-one mass customization profitable." ←

Robert Kickinger
Manager - Mechatronic Technologies, B&R

"Many times, all you need to make a personalized product is one short section of flexible, intelligent, track-based transport."

Author: Carmen Klingler-Deiseroth, freelance journalist

Digital display transmission with SDL4

Smart Display Link 4 transmits all communication channels between PC and HMI panel via a standard Ethernet cable and is independent of operating system and software.

B&R presents new generation of HMI panel interface

B&R recently introduced the fourth generation of its display transmission technology, Smart Display Link (SDL). SDL4 is based on HDBaseT 2.0 and can span up to 100 meters between the industrial PC and display device. This makes it easy to equip expansive machines and systems with multiple remote HMI panels.

Up to 100 m

SDL4 makes it possible to transmit display content and other data over much greater distances. It's possible to span up to 100 meters between PC and display. An additional highlight of SDL4 is its use of standard Ethernet cables, which drastically reduces cable costs over longer distances.

The thin cable and slim RJ45 connector are a perfect fit in tight situations such as feed-through openings and swing arm systems.

Up to 4 HMI panels per PC

An SDL4 converter allows up to three panels to be connected to one Automation PC. A fourth Automation Panel displaying different content can also be operated via an additional SDL4 interface. This is B&R's response to the needs of modern manufacturing systems, which increasingly feature multiple locally-mounted operator panels.

Independent of operating system and software

The modular design of B&R's PC and panel systems allows any Automation Panel to be equipped with an SDL4 interface. SDL4 transmission technology is independent of software and operating systems and integrates all communication channels – including USB, touch screen and function keys – in one single cable. SDL4 transmits all signals uncompressed and in high resolution for optimum image quality.

Photo: B&R

Remote I/O expansion for mobile automation

B&R is expanding its X90 control and I/O system to include an I/O module for connecting distributed sensors and actuators on mobile equipment.

B&R expands the X90 control and I/O system

With its new X90 CAN bus controller, B&R makes it easier to connect remote sensors and actuators to mobile machinery. The scalable X90 control and I/O system allows efficient implementation of automation concepts for construction, agricultural and municipal vehicles. Customers benefit from comprehensive solutions based on the B&R technology platform.

Many possible uses

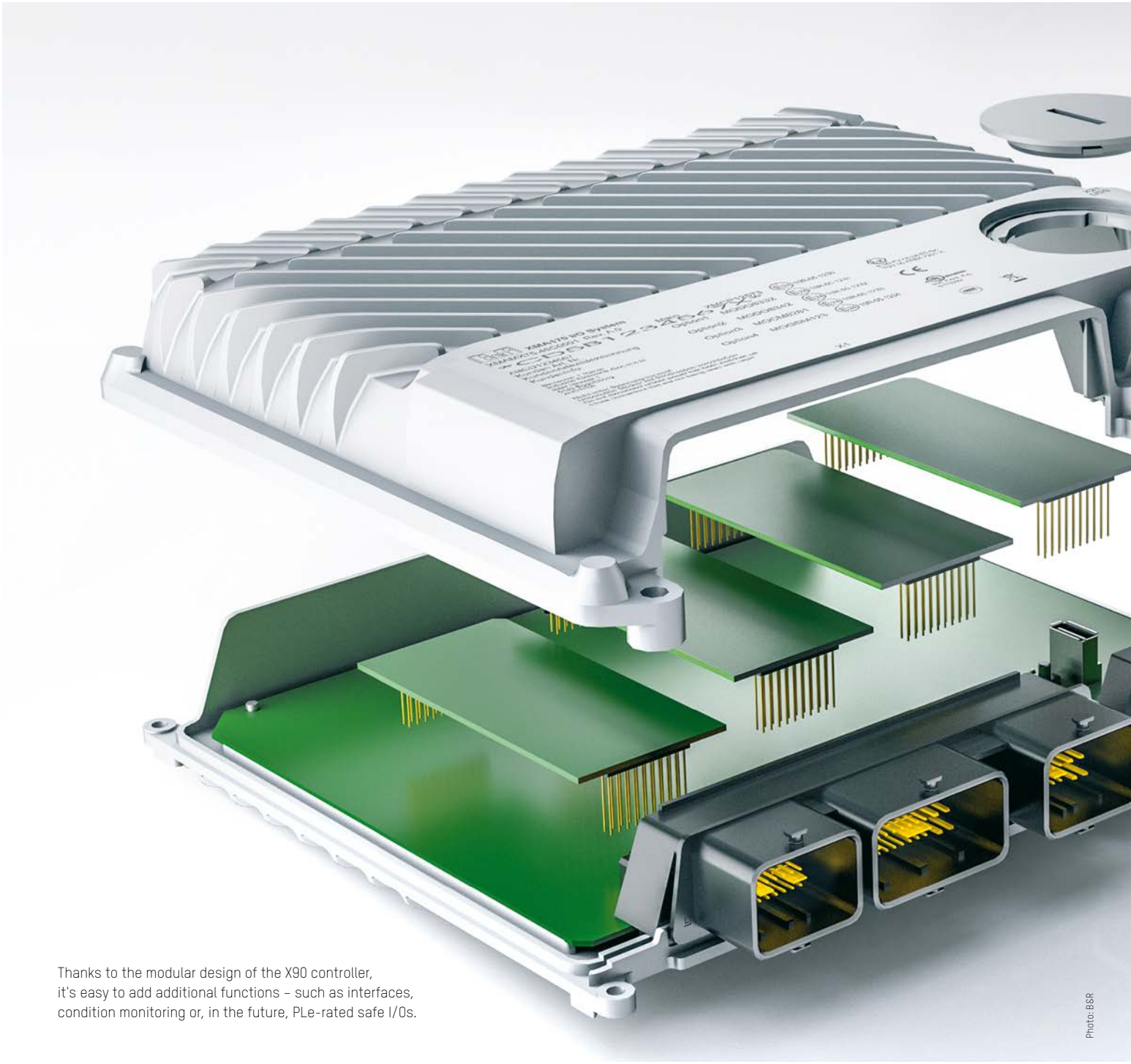
The standardized CANopen interface and multifunction I/O channels make the X90 bus controller extremely versatile. All functions are configured in the control application using the B&R Automation Studio development environment.

For harsh environments

All products in the X90 family are designed for rugged use in mobile machinery. They can handle operating temperatures from -40 to +85°C (housing surface) and are resistant to vibration, shock up to 50 g, salt, UV light and oil. The housing provides IP69K protection.

Photo: B&R

Safety for mobile machines



Thanks to the modular design of the X90 controller, it's easy to add additional functions – such as interfaces, condition monitoring or, in the future, PLe-rated safe I/Os.

Photo: B&R

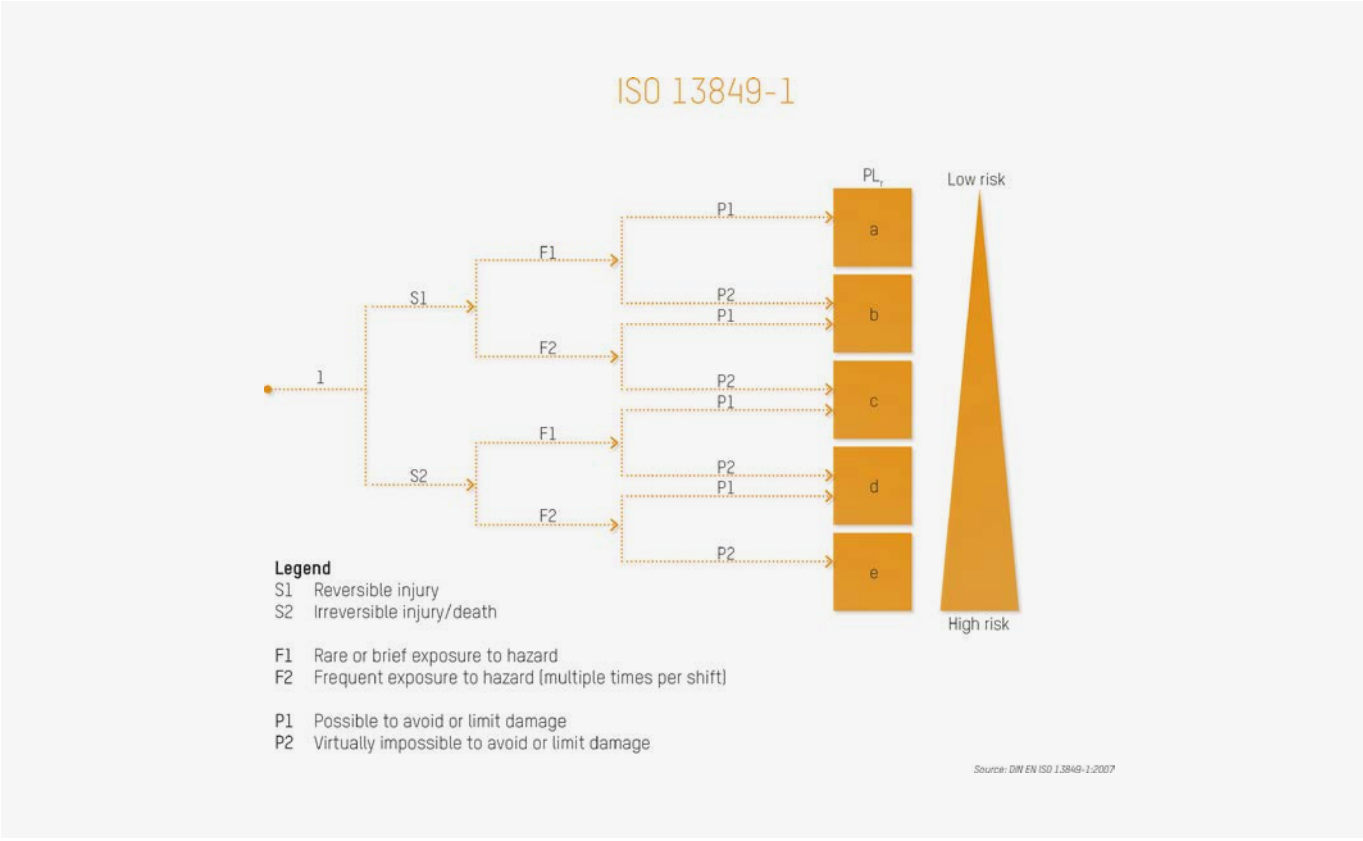
As mobile machinery becomes increasingly automated, its manufacturers must address the requirements of the European Machinery Directive and the topic of safety technology. To avoid the added cost of developing safety solutions in-house, many of them seek assistance from a reliable technology partner.

The evolving market requirements for mobile machinery can no longer be met with mechanical solutions. As a result, agricultural, construction and municipal vehicles are becoming increasingly automated. That means implementing things like cloud connectivity and autonomous or semi-autonomous processes. Stefan Taxer, B&R's product manager for mobile automation, observes: "The level of automation we see in mobile machinery has skyrocketed over the past few years."

One of many examples of automated processes are drive-by-wire systems, which transmit information from the gas pedal electrically rather than mechanically. These systems offer many advantages, but are not without risk: "A malfunction while driving could cause a serious accident," notes Taxer. Safety technology is therefore critical for the drive system.

Identifying the safety level

But how does the manufacturer of a mobile machine know which requirements a safety solution must meet? First, they must determine whether the application falls under the jurisdiction of the European Machinery Directive – which is the case for nearly every



The exact performance level required for a given machine can be determined through a risk assessment as specified in ISO 13489-1.

mobile machine built today. "The Machinery Directive requires manufacturers to carry out a hazard analysis and risk assessment using a risk graph in order to determine the necessary level for the safety function," explains Taxer. From experience, Taxer knows that mobile machinery must generally achieve safety integrity level SIL 2 and performance level PL c.

According to Taxer, achieving these safety levels is no problem using programmable safety technology. "Nevertheless, many manufacturers shy away from programmable safety technology because they consider it too complex," says Taxer. He explains that this does not have to be the case – using the B&R system as an example: "For a wide variety of safety functions, there are software blocks available that are pre-certified by TÜV. The task of safety programming itself is thus reduced to simple configuration and linking of the safe software blocks via ladder diagram. The machine manufacturer then only has to prove to TÜV that this work has been carried out in accordance with the guidelines for safe development." This drastically reduces complexity, workload and certification time.

Modular system

The hardware to go with B&R's programmable safety technology is the X90 safety control and I/O system. The performance of the controller is scalable over a wide range and can be supplemented with functions such as additional I/Os, interfaces or vibration-based condition monitoring. The housing is extremely robust and features IP67K protection.

Future-proof technology

As a technology partner, B&R goes to great lengths to ensure that its platforms are future proof. If the safety requirements increase to SIL 3 or PL e, for example, there would be no need to redesign

Photos: B&R

the hardware. The controller is already designed to support PL e. "In that case, we'll simply develop a new option board with the corresponding I/Os that meet PL e requirements," says Taxer. This board can then be easily integrated into the X90 controller.

B&R also takes great care to ensure that interaction between the standard and safety-related components of a machine application is future proof. The user can imagine the safety solution as a protective yellow shell around the standard machine application. "As long as all the parameters stay within their limits, everything is fine. If a value strays outside its limits, the safety controller takes over and guides the machine into the defined safe state," explains Taxer. The big advantage of this is that when you modify or expand the machine application, there's no need to make any changes to the protective shell. Taxer: "That means there is no need for re-validation or re-certification."

Technology partner with industry experience

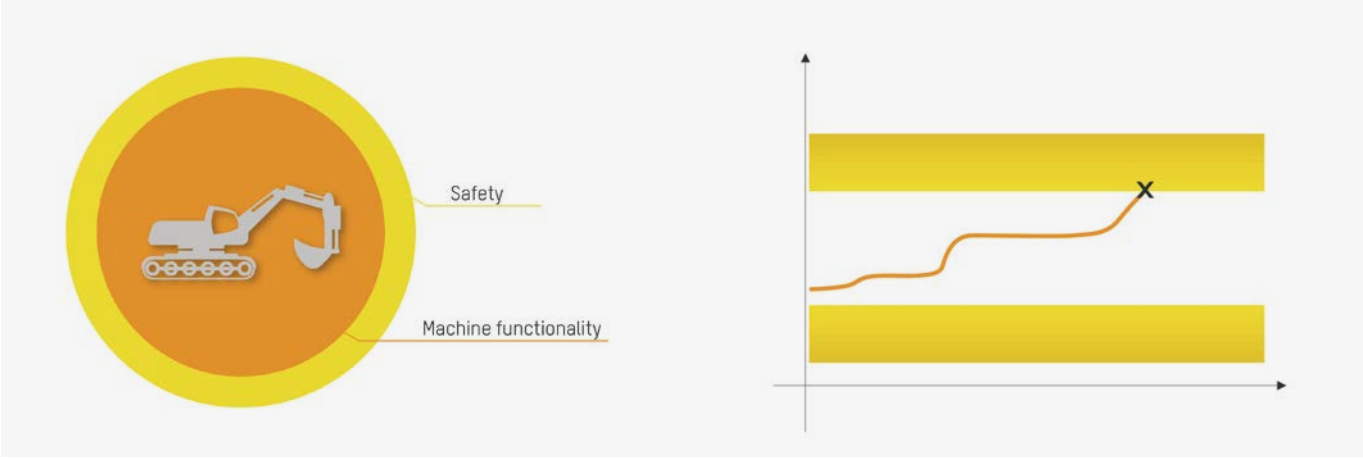
The Machinery Directive is gaining significance for manufacturers of mobile machinery due to increasing levels of automation. Automation specialist B&R has ten years of experience in the field of functional safety and in implementing the directives in industrial applications. This experience applies equally well to the agricultural, construction and municipal sectors. "With our comprehensive hardware and software platform and easy-to-configure engineering modules, we are the ideal technology partner for developing safety solutions for mobile machinery," says Taxer with conviction. ←

Stefan Taxer
Product Manager - Mobile Automation, B&R

"Programmable safety technology from B&R makes it easy to implement Machinery Directive requirements on mobile machines."

Machinery Directive 2006/42/EC

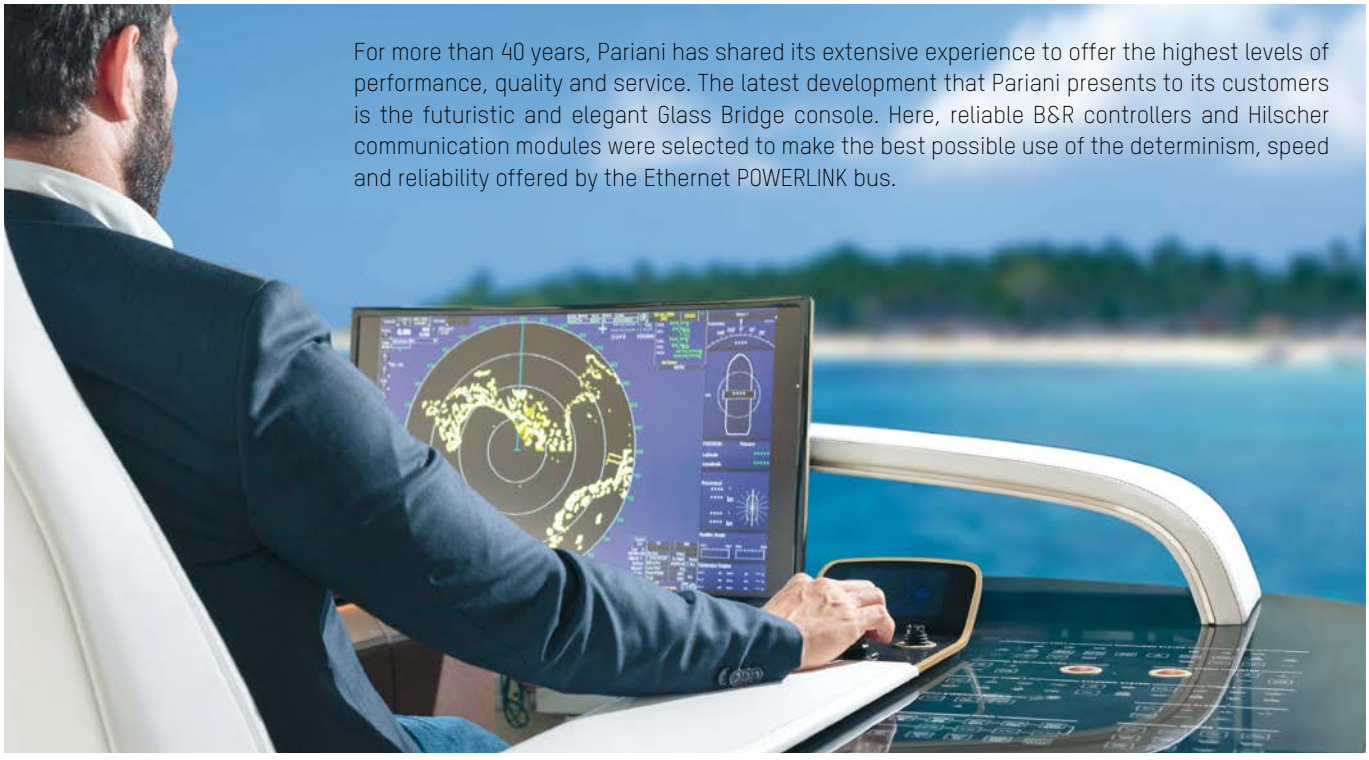
The EU's Machinery Directive regulates which safety measures must be taken by machine builders to ensure that their machines do not pose any danger to operators or others. The primary standards listed and harmonized for this purpose are ISO 13849 for the design of safety-related controls and IEC 62061 for the safety integrity level (SIL). These two standards are internationally recognized and therefore also apply outside the European Economic Area. B&R safety technology products meet the requirements of both standards. Other harmonized standards specify requirements for respective machine types, for example ISO 25119/EN 16590 for tractors and agricultural and forestry machines.



B&R's safety solution forms a protective yellow shell around the machine functionality – only intervening if a parameter strays outside of its defined limits.

Luxury meets ergonomics and elegance

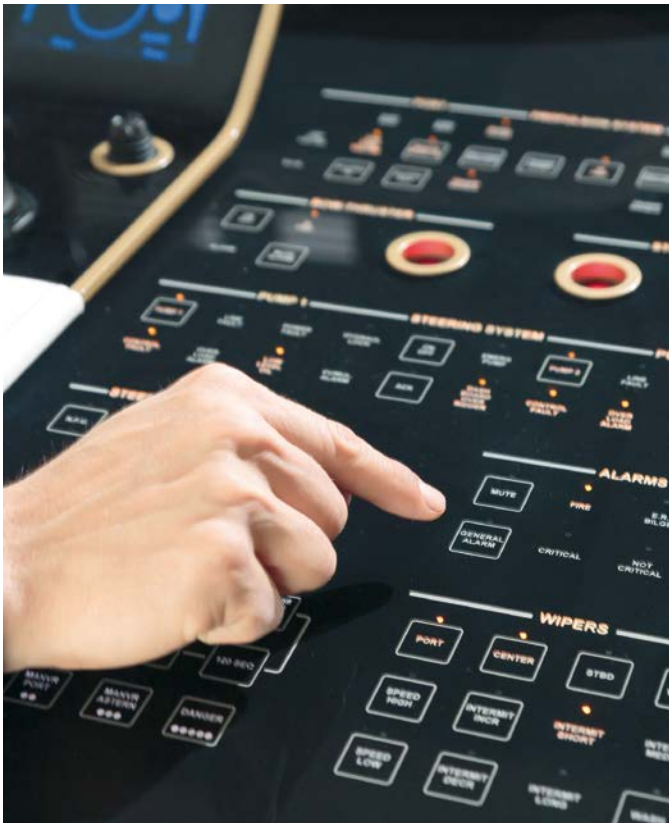
When you bring together companies like Pariani, B&R and Hilscher to build a control system for luxury yachts, it should come as little surprise that the result blends elegance and sophisticated design with reliable, cutting-edge technology truly worthy of the designation "7-star command bridge".



For more than 40 years, Pariani has shared its extensive experience to offer the highest levels of performance, quality and service. The latest development that Pariani presents to its customers is the futuristic and elegant Glass Bridge console. Here, reliable B&R controllers and Hilscher communication modules were selected to make the best possible use of the determinism, speed and reliability offered by the Ethernet POWERLINK bus.

Photos: Pariani

Whether during a maneuver or at full speed ahead: everything on the bridge must be fully operational. On a super-yacht, no detail is left to chance. That is why Pariani has designed the Glass Bridge console as the highest expression of technology and ergonomics. Design and Italian flair are combined with automation and sophisticated communication technologies to provide an incomparably emotional and tactile control experience.



The console is controlled by powerful X20 modules from B&R. Each of the controllers on the reliable real-time network is operated by Hilscher netX communication processors. Glass Bridge communicates with POWERLINK. The result is an intuitive, personalizable command bridge any captain would be happy to rely on for a safe journey.

For the Glass Bridge, Pariani chose the efficiency, robustness and flexibility of the POWERLINK bus – a communication standard that is highly valued in the shipbuilding sector. In addition to control stations, POWERLINK-enabled hardware components have been developed to meet the industry's strict requirements for security, stability and transparency.

Cloud connectivity

Cybersecurity for controllers

Transferring data from the machine controller to the cloud requires a connection to the Internet. This, however, makes it susceptible to cyberattacks. Machines with cloud connectivity therefore need special protection.

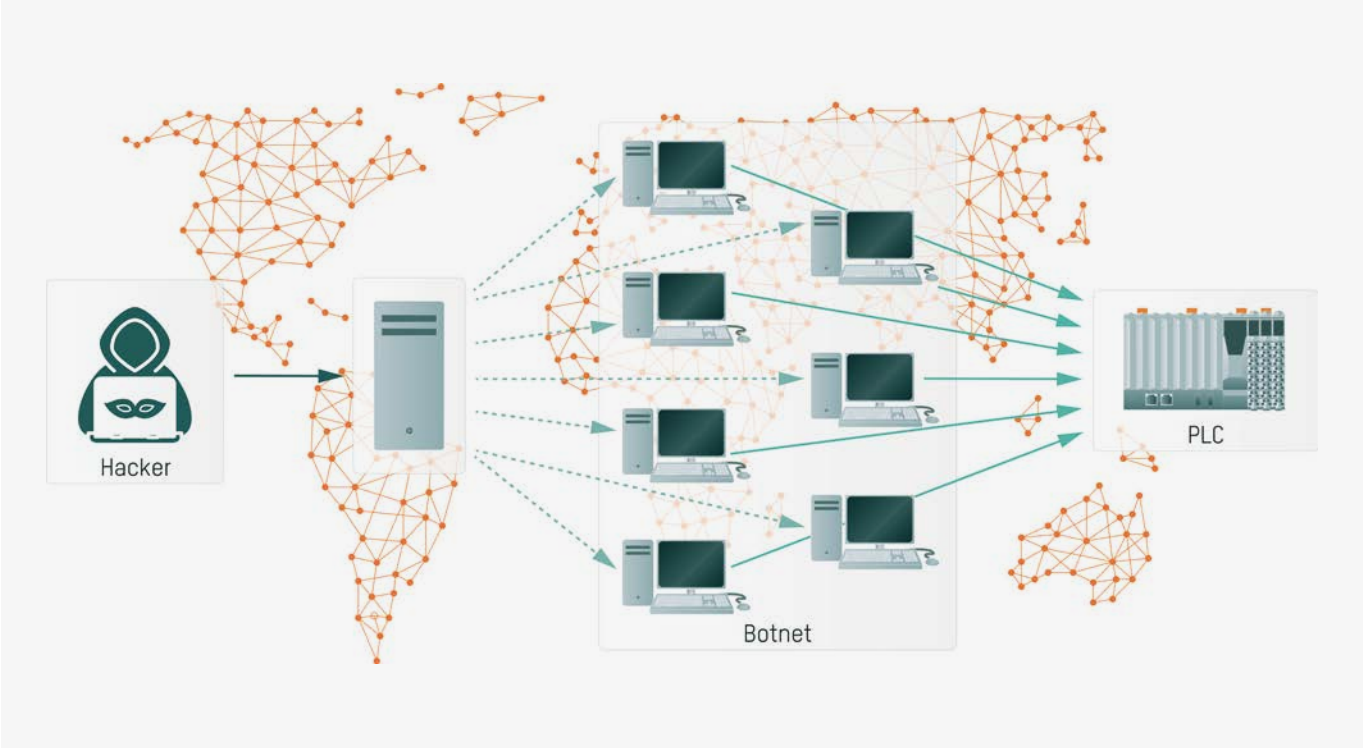
Prior to the Industrial Internet of Things (Industrial IoT), machine controllers communicated – if at all – only with each other or with higher-level systems inside the company network. A direct connection to the Internet was very rare. Machine builders and operators had no reason to concern themselves with the topic of cybersecurity. "But that is changing," explains Andreas Hager, B&R's product manager for control systems. In Industrial IoT solutions, industrial PCs and other hardware are used as edge devices with a direct connection to the Internet. This opens them up as potential targets for hackers.

DDoS attacks

Hackers can paralyze controllers and thus entire machines, for example, by overwhelming them with traffic. This is known as a DDoS (Distributed Denial of Service) attack: A hacker distributes attack programs across a so-called botnet comprising several hundred to a thousand computers, smartphones and tablets, effectively weaponizing them. On command, the bots then bombard a machine controller with so many simultaneous requests that it fails under the load and the machine stops – as demonstrated recently by a malware attack at a microprocessor manufacturer.

Open ports

To transfer data to the cloud, ports must be opened on the machine controller. "As long as the communication channel between the controller and the cloud gateway is open, these ports are an open window for hackers," explains Hager. That's not the only



In a DDoS attack, a hacker distributes programs across a botnet to make a concerted attack that paralyzes a controller.

problem, however. Devices that are directly connected to the Internet must be updated regularly to close newly discovered gaps in security. "Many machines run for weeks or months on end," notes Hager. Yet, updates can only be installed when the machine is stopped. Following an update, it may even be necessary to adjust the application. "That's a lot of work, and in the long run simply not a viable answer." Luckily, there is a simple solution: the control functionality and communication functionality must be isolated from one another. That way, a DDoS attack would be unable to penetrate deep enough to affect machine control. "In the worst case, you might loose communication with the cloud, but the machine itself can continue to operate," emphasizes Hager

B&R has introduced the SiteManager for this purpose. The device has an integrated firewall and performs all the tasks required for cybersecurity, such as keeping cloud certificates up to date and applying patches to close security holes.

Cloud connectivity

To transfer data to the cloud, the controller connects with the SiteManager via OPC UA. During configuration, the user defines which data is to be transferred. It is also possible to transfer different data to different cloud providers. Configuration is a simple matter of checking boxes in the SiteManager's web-based user interface. If a cloud certificate needs to be updated, the machine operator doesn't have to do anything. The SiteManager automatically downloads and installs updates without affecting machine operation. This also ensures that the security guidelines of the cloud providers are always adhered to and any potential security gaps are closed quickly.

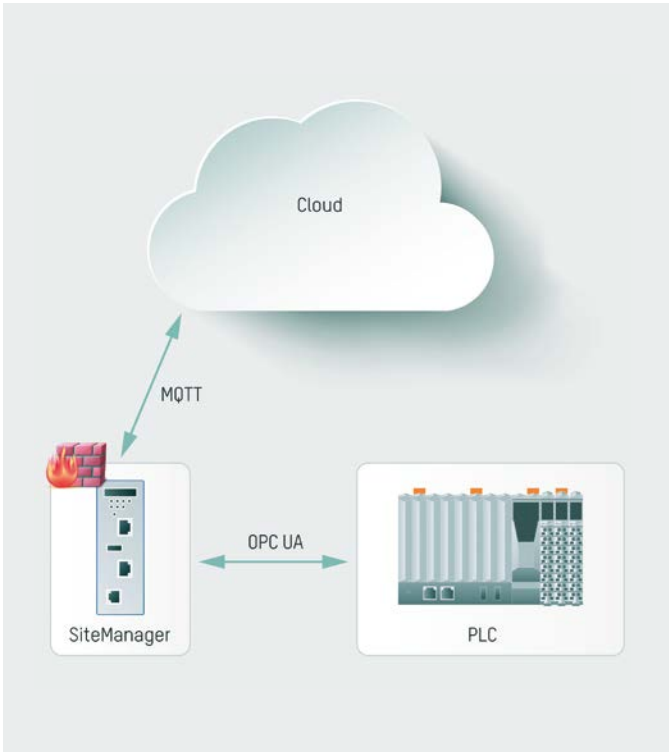
Secure remote maintenance

"The security requirements for remote maintenance are very similar to those for cloud communication," explains Hager. The SiteManager is therefore perfectly suited for this purpose as well. The device allows service technicians to connect to the machine control system via a secure VPN connection and search for errors. A user management system provides clearly defined and tamper-proof control over which technicians have access to which controllers. "With a technician on site, it is then possible to begin a targeted troubleshooting process," says Hager. "The SiteManager ensures that any data transferred between the machine and applications outside the company network are protected against unauthorized access and cyberattacks." ←

Andreas Hager
Product Manager - Control Systems, B&R

"Having the SiteManager between the controller and the cloud ensures that any data transferred between the machine and applications outside the company network are protected against unauthorized access."

Photos: B&R



The SiteManager transfers data securely to the cloud.

Edge computing

Edge computing is a method of collecting large volumes of data near its source so that it can be compressed and aggregated before being passed on to higher-level systems. The link between real-time systems at the machine and process level (OT = Operational Technology) and the world of IT is known as an edge device. B&R offers three different types of edge device to cover all applications: Edge Controller, Edge Embedded and Edge Connect.

The B&R SiteManager

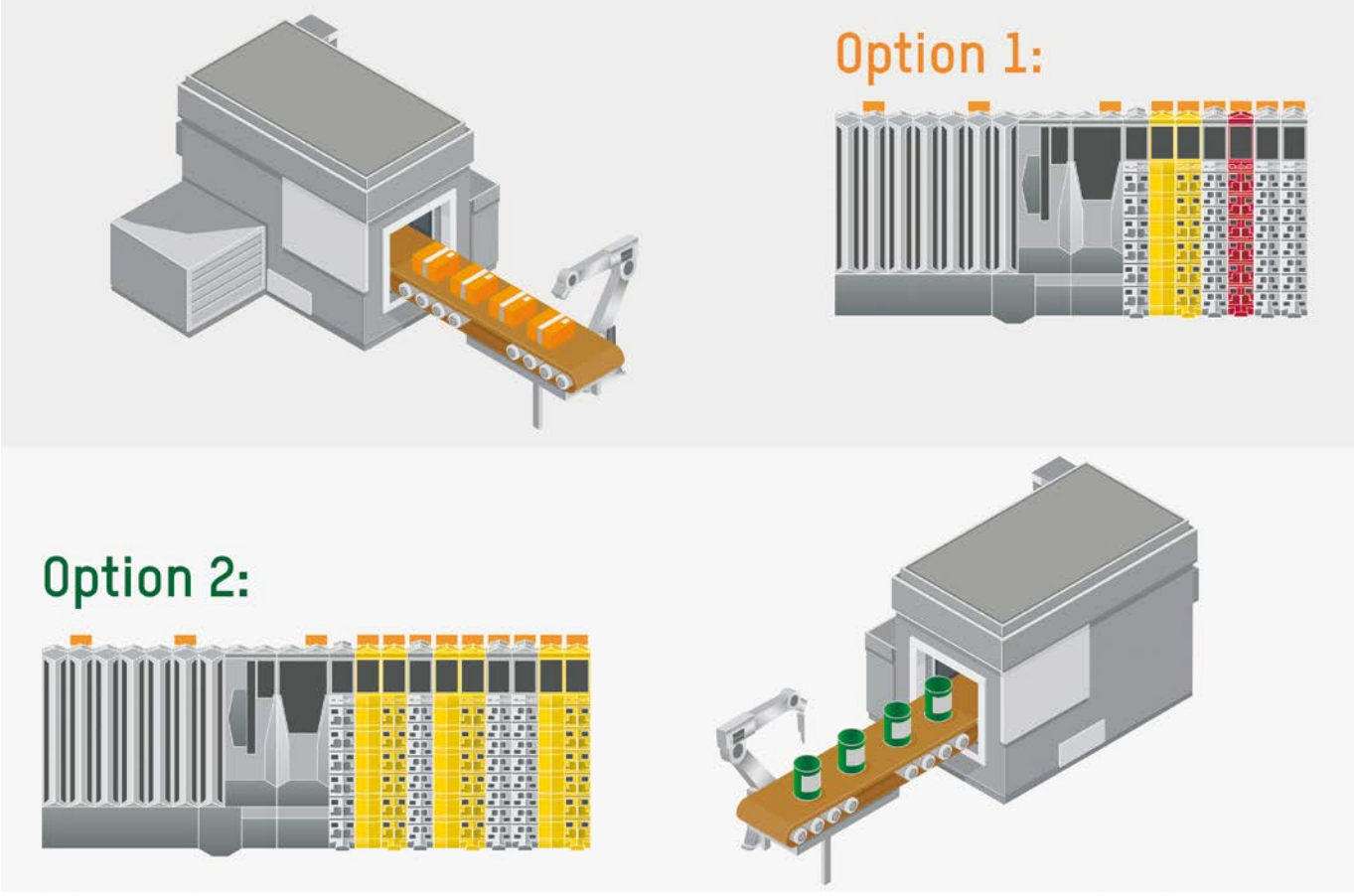
The B&R SiteManager is available in three variants, providing an Internet connection via LAN, WLAN or mobile network. All three variants are equipped with an integrated firewall. In order to avoid conflicts with plant firewalls, communication to the Internet is handled using firewall-compatible encrypted web protocols. In addition to the three hardware variants of the SiteManager, there is also a software version that makes it possible to combine the SiteManager and machine controller in one device. This is made possible by using B&R Hypervisor to install two operating systems on an industrial PC: the real-time operating system for machine control and a Linux or Windows system for the SiteManager. The two operating systems run completely independently of one another. Even if the SiteManager were to be blocked by an attack or the general purpose operating system would crash, machine control would continue unaffected.

B&R Hypervisor makes it possible to use an industrial PC simultaneously as both a machine controller and an embedded SiteManager. No additional hardware is required.

The B&R SiteManager is available in three variants, providing an Internet connection via LAN, WLAN or mobile network.

Author: Carmen Klingler-Deiseroth, freelance journalist

Manage hardware configurations with ease



With the new software component mapp IO, B&R's entire hardware portfolio can be added to machinery and equipment at runtime.

New software component simplifies management of machine variants

Modular applications can now be implemented even more easily. B&R's new software component, mapp IO, makes it possible to add I/O modules at any time. This can happen before a machine is delivered or even at runtime, thereby greatly simplifying the task of managing variants of machinery and equipment.

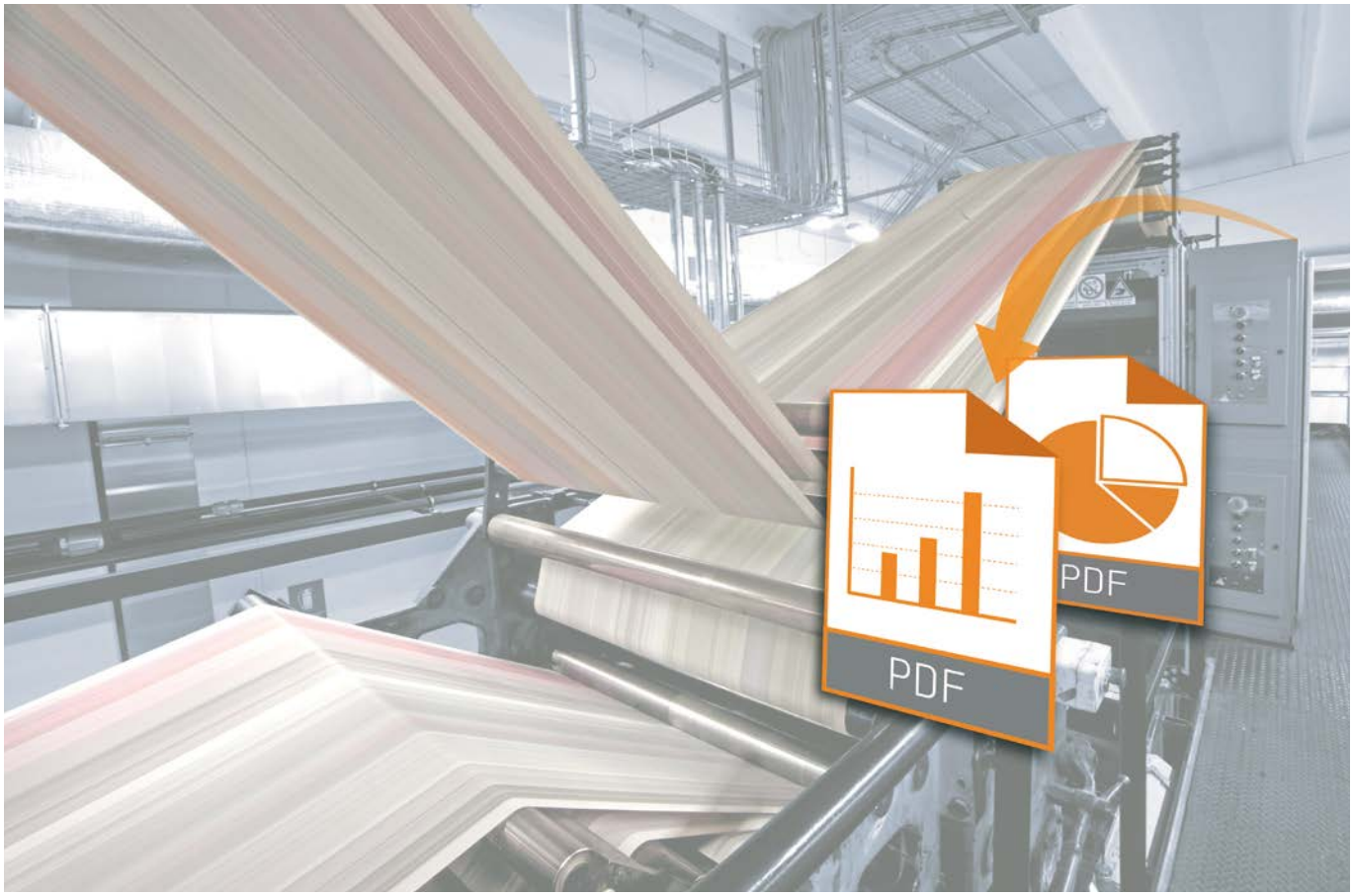
Configuring variants

With mapp IO, I/O configurations can be generated directly from an ERP or order management system. No engineering tools are required, even if third-party drives or modules are added. Additional variants and options are configured directly on the machine using mapp IO and then programmed using mapp mapp CodeBox.

With mapp CodeBox, you can program options in ladder logic without affecting the machine's primary application. The machine can be commissioned without having to modify the original machine software.

Photo: B&R

Collect and present machine data



The mapp Report software component can be used to automatically generate PDF reports based on any machine data.

mapp component automatically generates PDF reports

The mapp Report software component can be used to automatically generate PDF reports based on any machine data. The data, layout and design of the reports can be customized. The user can freely define the language and units used. mapp Report collects all statistical machine data as well as information from other "mapp components" and presents it in the form of PDF reports. The content and layout can be customized as desired.

For all audiences

The design options offered by mapp Report make it possible to customize reports for the needs different users, such as service technicians and management. Graphical elements such as images and tables can also be included in the reports. To protect against unauthorized access, it is possible to encrypt the files with a password.

Send reports automatically

The reports can be sent automatically via e-mail at a defined time or triggered by a specific event. In addition, reports can be saved to external storage media such as a USB flash drive or sent directly from the machine to network printers.

Photo: B&R

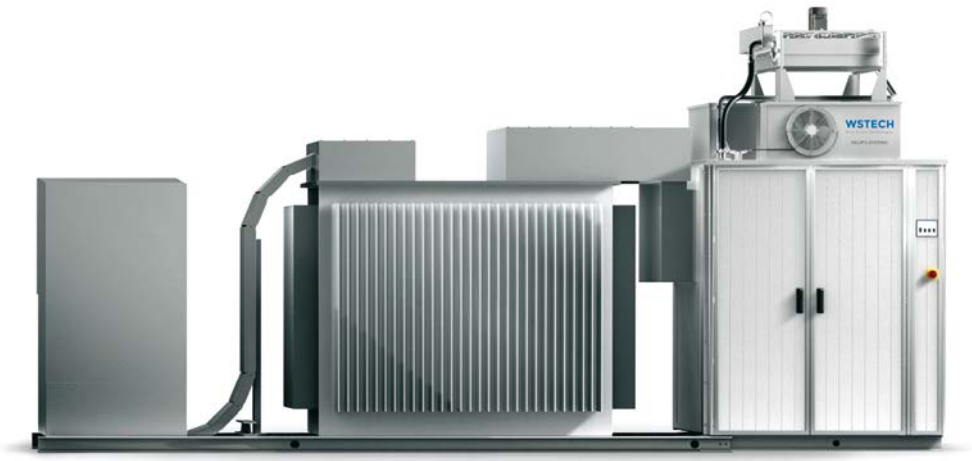

X20 CP 0410
USB 1
USB 2
R/E
RDY/F
S/E
IF2
X20 PS 9500
r e
S I
C T
IF2
X20 CP 0482
USB 1
USB 2
R/E
RDY/F
S/E
IF3
IF2
X20 PS 9500
r e
S I
C T
IF3
IF2

Photo: B&R

Power grid technology

Reliable renewables

In principle, a power grid is a zero-sum game: whatever electrical energy is fed into it must also be consumed at the same moment – no more and no less. Sounds simple enough in theory, but is often quite different in practice. Growing numbers of photovoltaic and wind systems present grid operators with enormous challenges. After all, consumers hardly base their behavior on whether or not the sun is shining or wind is blowing. WSTECH, based in the northern German town of Flensburg, has proven that these challenges can be overcome with POWERLINK.



WSTECH inverters are characterized by maximum cost efficiency.

When generating renewable energy, it is important to comply with the legal requirements of Germany's medium-voltage directive. This applies to much more than simply feeding it the right voltage and frequency. Feed-in systems must also comply with detailed specifications with regard to the presence of disturbing harmonics and must also be able to play an active role in static and dynamic grid stabilization. All these tasks fall on the inverters that form the heart of the feed-in system. They process the DC voltage coming from the photovoltaic cells or the AC voltage coming from the wind generators with variable frequency and then feed it into the supply grid as needed.

Powerful inverters from 500 to 6,000 kilovolt amperes

Since the company's founding in 2001, the approximately 100 employees of WSTECH, based in the northern German town of Flensburg, have acquired extensive know-how. Siemens AG now has a stake in the company in a joint venture. Their expertise includes the development and production of controller assemblies in which the inverters are controlled with a pulse pattern via their IGBT modules. "This assembly represents our core competence and is used in all types of devices," says R&D team leader Mark Ahmling. "With its fast and accurate control loops, it ensures that the current reaches the grid in sinusoidal form and free of harmonics." To perform the trick they use to achieve this, WSTECH developers need a high-performance fieldbus that is virtually jitter-free.

POWERLINK for maximum synchronicity

By phase-shifting multiple power modules by exactly 180 degrees, the 10-kilohertz harmonics cancel each other out rather than having to be filtered out afterwards. "Not only does this trick enable us to reduce the amount of filter technology needed, it also significantly increases operational reliability," emphasizes Ahmling. It

Photo: WSTECH

Mark Ahmling
R&D Team Leader, WSTECH

"With the SoC signal from POWERLINK, we are able to synchronize our systems virtually jitter-free. This enables us to achieve a high level of operational reliability and, at the same time, significant cost savings in the area of mains filters."

only works, however, if all the modules involved operate and communicate synchronously within a tolerance of ±2 µs.

In its search for a suitable bus system, Ahmling's team discovered B&R technology and, in particular, POWERLINK. The choice fell on a primary controller from B&R's X20 series, connected to secondary controllers, measuring boards and other components via POWERLINK. The virtually jitter-free SoC signal (= single-chip system) from POWERLINK now keeps all the components precisely synchronized and is therefore the key to success. Another factor that distinguishes this bus from its competitors is the extensive amount of data that can be exchanged in real time.

Open and independent

The use of the X20 controller has other advantages for WSTECH as well. "The real-time capable Automation Runtime operating system makes us independent of Microsoft and reduces the risk of malware," explains the developer. "At the same time, whenever we're looking at interfaces, openness is a key criteria." This is required in order to be able to communicate with other systems in which the Modbus protocol is currently still the standard. Remote maintenance is also important for Ahmling, as WSTECH systems are exported worldwide. This is achieved in B&R's Automation Studio engineering environment using the integrated Visual Components 4 tool and VNC server. This enables service technicians to log on to any system in the world, analyze its condition online and intervene if necessary.

Stable supply grid into the future

Generation of renewable energy results in a growing number of decentralized feed-in points. As this number rises, however so do the requirements for grid stability. To ensure this, the components involved must react ever faster to control commands from grid management systems and regulate them ever more precisely.

"Especially in the wind energy sector, communication cycles of 10 to 40 milliseconds are already standard today and will certainly become even shorter in the future. So it's certainly good to be prepared for it today," says Ahmling.

And the system concept implemented by WSTECH does precisely that. It also opens up new applications for the WSTECH inverters, such as battery storage that allows excess energy to be dynamically absorbed and released on demand. One example is the lithium-ion battery storage facility in Jardelund in the German state of Schleswig-Holstein, which has an output of 48 megawatts and a storage capacity of 50 megawatt hours. This allows energy flows to be stored or fed into the grid within fractions of a second – a crucial factor in ensuring high grid stability.

Higher-level plant communication requires a standardized, real-time-capable and above all secure IT network. With the availability of OPC UA and real-time Ethernet based on the Time-Sensitive Networking standard (TSN), the B&R system supports these requirements perfectly. ←

Industrial PCs

Two operating systems on one device

In addition to their real-time operating system, many machines also need a general purpose operating system to perform tasks such as aggregating data and sending it to the cloud, or to run business intelligence analytics or computationally intensive HMI applications. Traditionally, this has required the use of two separate pieces of hardware. With a bare-metal hypervisor, it is now possible to implement both systems on a single industrial PC without any compromise in performance.

The hypervisor can run on any of B&R's industrial PCs – from the ultra compact Automation PC 2200 with an Intel Atom processor to the powerful Automation PC 910 with an i7 processor.

Photo: B&R


Automation PC
Automation PC

The RTS hypervisor allows all of the hardware resources of an industrial PC to be allocated unambiguously.

Modern controllers and real-time operating systems offer extremely high performance and are able to perform a multitude of functions. Nevertheless, it is often advantageous to run additional functions and software applications on a separate operating system. "Specialized programs for simulation or 3D animations are often run on a Linux or Windows system," explains Gerd Lammers, president of Real-Time Systems. Web applications also often run in Linux or Windows environments rather than on real-time systems.

Lower costs

Separate hardware can be used for control and additional functions without any compromise in performance. "The advantages of an integrated solution speak for themselves," explains Lammers: faster communication and reduced space requirements in the control cabinet. The available hardware resources are also utilized more efficiently. Costs are reduced.

For many years, the solution for running multiple operating systems on a single

Photos: B&R

hardware device has been virtualization. "Virtualization technology has one major disadvantage," explains Manfred Mitterbuchner, automation software manager at B&R. "The operating systems interfere with one another. If one crashes, it causes problems on the other. If one of the operating systems is responsible for controlling a machine or line, that could have grave consequences – whether that means an unplanned outage, a damaged machine or even an injured operator."

Manfred Mitterbuchner
Technology Manager - Automation Software, B&R

"The hypervisor allows multiple operating systems to run on a single device, entirely independently of one another."

No interference

What is needed is therefore a solution that prevents interference between the two systems. "You can't have a host system with the other system running on top of it," stresses Mitterbuchner, "and you need sufficient performance to guarantee real-time behavior." The only way to achieve this is if the hardware is allocated to each operating system unambiguously. This is made possible by what is known as a bare-metal hypervisor. "It's called 'bare-metal' because it runs directly on the hardware rather than being tied to an operating system."

In cooperation with hypervisor specialist Real-Time Systems, B&R has integrated a bare-metal hypervisor into its automation system. This now makes it possible to run both Automation Runtime and a general purpose operating system on the same hardware.

All resources clearly allocated

"The hypervisor makes it possible to clearly allocate all of the available resources," emphasizes Mitterbuchner. Not only the processor cores, RAM and Ethernet interfaces, but also the USB and other ports can be clearly assigned to a specific operating system. "We also support the latest Intel technology in this area," adds Lammers. "With Cache Allocation Technology, the last level cache is also clearly assigned to the specific operating systems." This maximizes the stability of all the operating systems.

Easy configuration

Configuring the hypervisor is extraordinarily easy. In B&R's Automation Studio engineering environment, the user simply enables the hypervisor and allocates the resources. Then the setup file is saved to a USB flash drive and installed on the target system via the boot menu. "After that, the hypervisor is ready to go," says Mitterbuchner.

The latest versions of Linux and Windows can be used as the general purpose operating system (GPOS). Whereas previous parallelization solutions were tailored to a specific Windows version, the hypervisor is completely independent of which operating systems are used. Installing updates, patches and upgrades is easy and straightforward. As more and more PCs are connected directly with the Internet, this is becoming an especially important feature.

Gateway for the IIoT

"The hypervisor is ideal for converting an industrial controller into an edge device or IoT gateway," adds Mitterbuchner. To do this, the real-time operating system (RTOS) uses a virtual Ethernet interface to send data to an application on the GPOS. There, the data is compressed and sent to higher-level systems via OPC UA . These systems can also be located in the cloud.

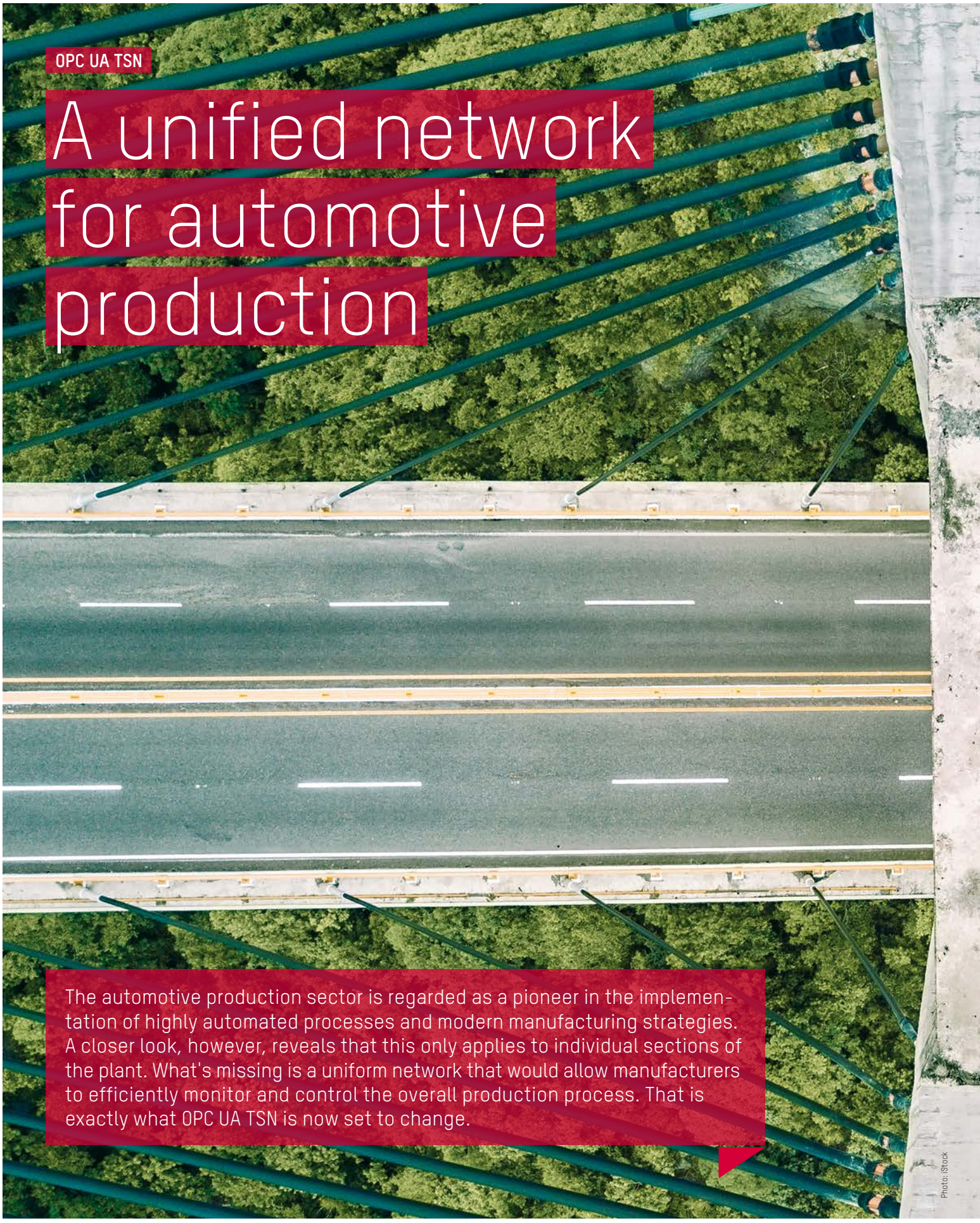
RTS Hypervisor runs on any B&R industrial PC with at least two processor cores. Users have a broad selection: from the ultra compact Automation PC 2200 with an Intel Atom processor to the powerful Automation PC 910 with an i7 processor. Mitterbuchner: "The combination of advanced hypervisor technology and our broad spectrum of industrial PCs allows our users to put together an optimal solution for any application."

About Real-Time Systems

Real-Time Systems is a globally active provider of Hypervisor technology specializing in real-time virtualization. The company is headquartered in Ravensburg, Germany, was founded in 2006 and since early 2018 has been a company of congatec AG with partners in Europe, USA and Asia. For more information, visit www.real-time-systems.com. ←

OPC UA TSN

A unified network for automotive production



The automotive production sector is regarded as a pioneer in the implementation of highly automated processes and modern manufacturing strategies. A closer look, however, reveals that this only applies to individual sections of the plant. What's missing is a uniform network that would allow manufacturers to efficiently monitor and control the overall production process. That is exactly what OPC UA TSN is now set to change.

Photo: iStock

For years, car bodies have been welded together by highly synchronized robots on fully automated production lines – the only job remaining for humans is to monitor whether all the machines are working correctly. "What appears to be a prime example of futuristic production, however, has one weakness," says Maurizio Tarozzi, head of business development at B&R. Between the individual production steps, there is no uniform communication technology. Instead, data can only be exchanged via specially programmed interfaces. "There is neither uniform production control nor shared data resources."

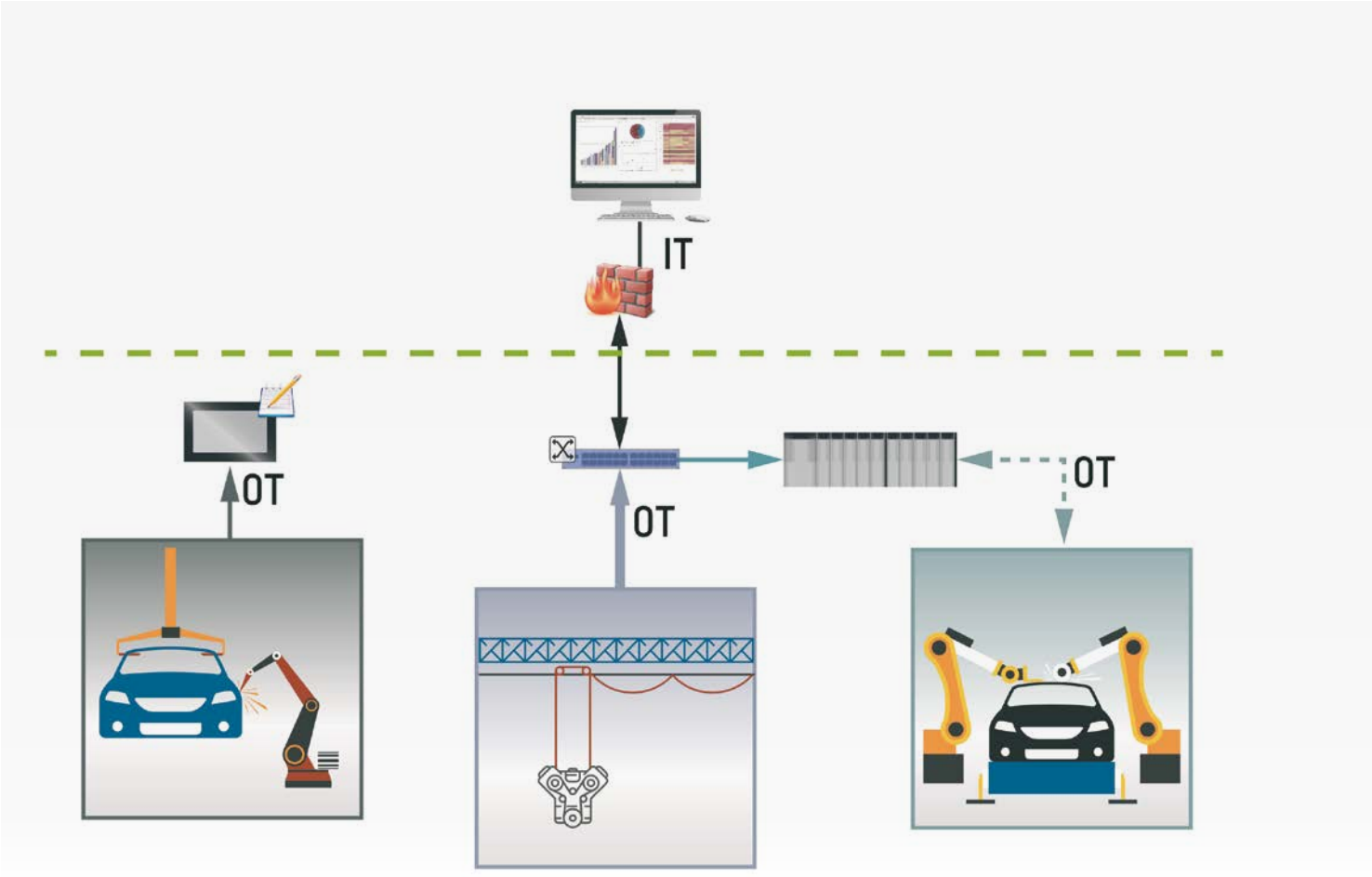
Digital connectivity

In many cases, each section of the plant has not only its own control system but a separate IT infrastructure as well. "Configuring and administrating such a large number of networks is costly and time consuming," says B&R's technology manager for open automation, Stefan Bina. Communication between these isolated islands is only possible via specially programmed gateways. "A lot of resources are wasted here." While the processes and procedures within a given section of the plant are highly optimized and automated, there is only a marginal amount of interaction between the individual production steps.

"A uniform network is a first step towards digitally connected manufacturing," adds Bina. Achieving this requires communication technology that is understood by all devices and components, regardless of manufacturer. That includes not only entire machines and lines, but also individual sensors and actuators as well as higher-level systems such as MES, SCADA and ERP systems.

Vendor-independent communication

"The demands on such communication technology are high," emphasizes Bina. The technology must permit real-time axis synchronization, for example. It must also be vendor neutral and feature integrated security mechanisms to transfer data to the cloud. "OPC UA TSN will be a huge step forward for the automotive indus-



OPC UA TSN turns a large group of isolated solutions with numerous interfaces...

try," Tarozzi is convinced. Not only will it enable real-time communication between the various sections of a plant, it will also make communication with higher-level systems faster, more efficient and more consistent. In turn, production planning can become much more precise and react to bottlenecks in real time. Historical data is also available, which can be viewed at any time by financial controllers or management.

Analyzing large volumes of data

"OPC UA TSN enables large volumes of data to be collected and analyzed – for example on an edge controller or in the cloud," says Bina. The prepared data can be used to optimize manufacturing processes. It's all made possible by the information models of OPC UA. "The protocol doesn't just transport dimensionless data," explains Bina. Instead, each variable value can be accompanied by additional information, such as units, limits and a description. "This greatly facilitates communication and data processing throughout multi-vendor systems," emphasizes Bina. Devices from different manufacturers can communicate with each other in one system without having to program any gateways or interfaces.

With OPC UA TSN, it will be easy to network the entire value chain.

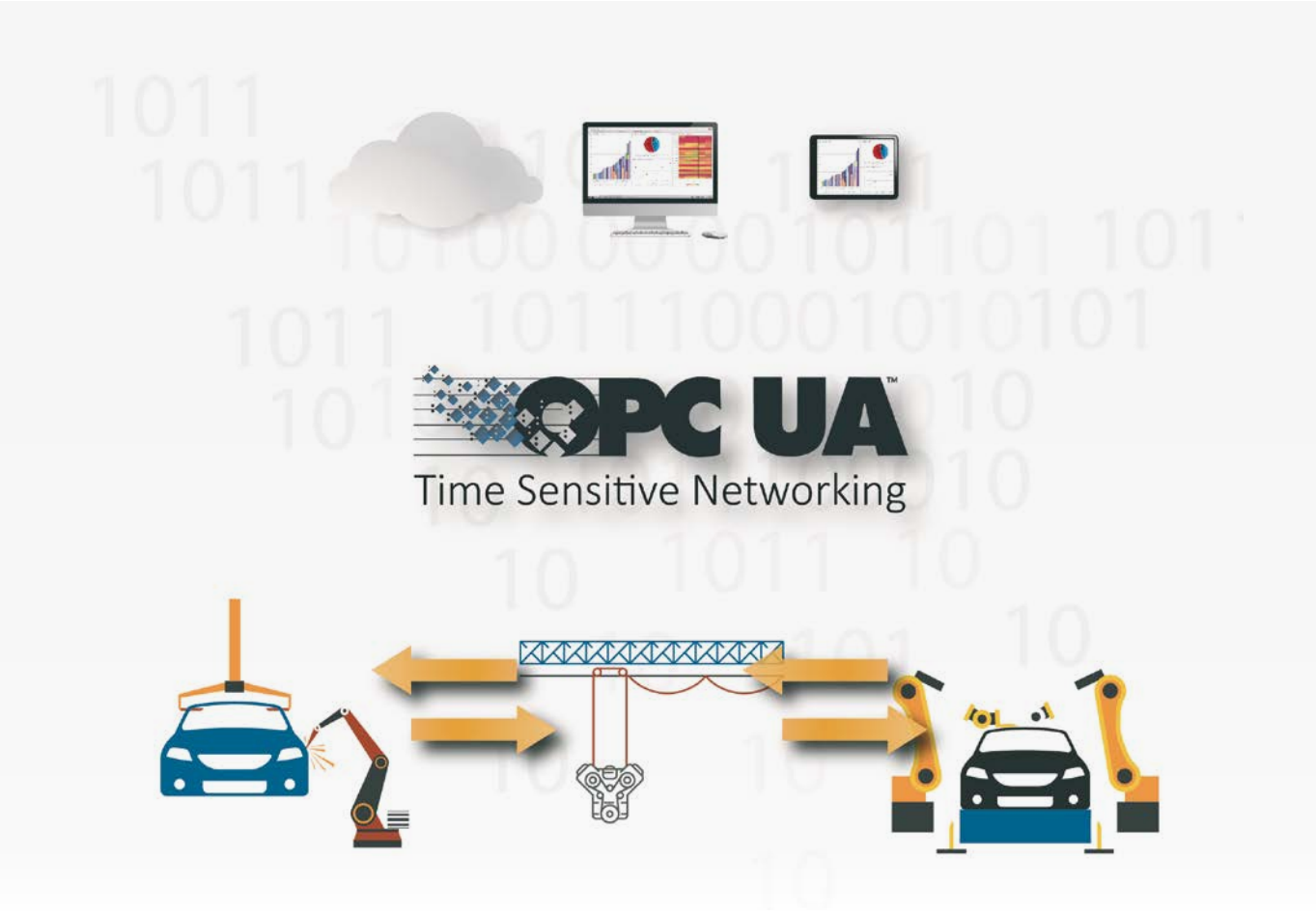
Costs sink radically with only a single network to manage, configure and administer. "You no longer need ten different specialists for ten different protocols," stresses Bina. "Together with numerous other automation and IT companies, we are currently working on mechanisms that will soon enable OPC UA TSN networks to configure themselves. Diagnostics will also be much easier compared to today's networks."

The connected value chain

"The benefits of OPC UA TSN do not end in the production hall," emphasizes Bina. The entire value chain can be better networked. When you're able to evaluate production data in real time, collaboration with suppliers can be scheduled with greater precision and a higher degree of automation. The after-sales area can also be integrated even more tightly.

"OPC UA TSN is a great opportunity for the automotive industry," summarizes Tarozzi. With uniform communication technology, automobile manufacturers will be able to make their production lines far more efficient than ever before. Productivity and profitability will follow hand in hand. ←

Photos: B&R



...into a homogeneous network for seamless communication across all systems and levels.

Uwe Siebert
Key Account Manager, B&R

"OPC UA TSN will be a giant step forward for the automotive industry."

Stefan Bina
Technology Manager - Open Automation, B&R

"OPC UA TSN enables large volumes of data to be collected and analyzed – for example on an edge controller or in the cloud."

The evolution of OPC UA TSN

In order for OPC UA TSN to meet industrial requirements, three important extensions to existing standards have been launched in recent years:

1. The addition of a publish/subscribe model: Until now, OPC UA has used a client/server mechanism, where a client requests information and receives a response from a server. This system has its limitations in cases when there are many nodes on the network. The publish-subscribe model, in contrast, enables one-to-many and many-to-many communication. A server sends its data to the network (publish) and every client can receive this data (subscribe).

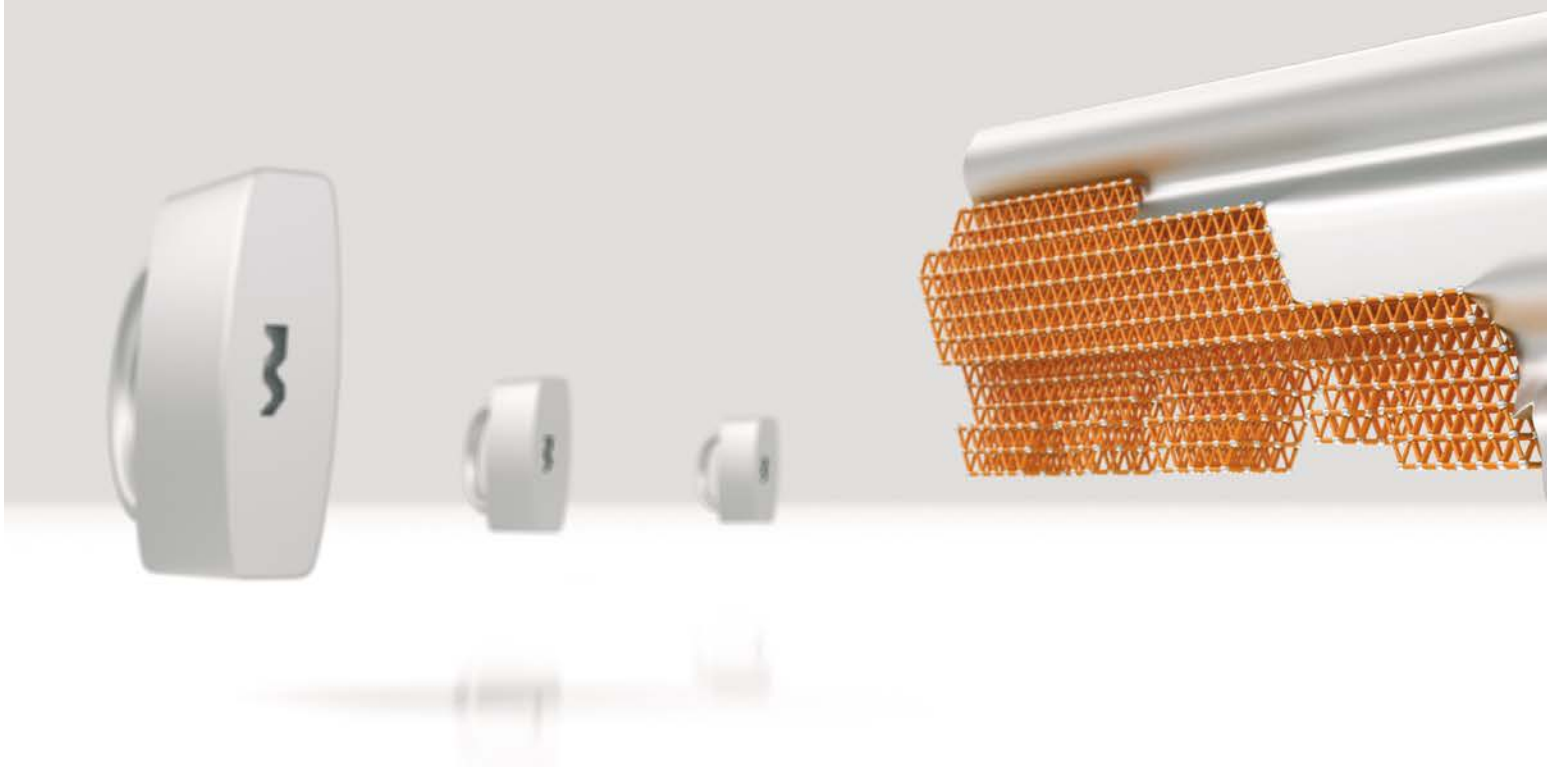
2. The extension to the Ethernet standard known as Time-Sensitive Networking (TSN): TSN refers to a set of sub-standards under the IEEE 802.1 family of Ethernet standards. It adds real-time capability to data transmission via standard Ethernet.

3. The establishment of an automatic configuration mechanism for OPC UA TSN: Even large and dynamic networks with OPC UA TSN will soon configure themselves automatically.

Specification work for a large portion of the necessary developments has now been completed. Interaction between the technologies is now being optimized in multi-vendor testbeds and the first OPC UA TSN enabled prototypes are being tested.

Robotics

Integrated robotics 4.0



MAJAtronic – a manufacturer of kinematic systems for platform-agnostic delta and DuoPod robots – has added articulated arm systems to its portfolio. Machine builders can now seamlessly integrate functions such as loading and palletizing into their preferred machine control system. A 6-axis articulated-arm demo robot from MAJAtronic shows how this can be done particularly fast and easily with B&R controllers thanks to mapp Technology.

Photo: B&R


mapp
TECHNOLOGY

In addition to delta and DuoPod kinematics, MAJAtronic now also offers controller-agnostic 6-axis articulated arm robots that can be easily integrated into B&R machine control systems. Thanks to mapp Technology, users without any special robotics know-how can implement them with ease.

When machine builders need a delta or articulated arm robot for a new machine or plant, their first instinct is to turn to one of the big names in the robotics industry. They offer a large selection of universally applicable industrial robots, specialty solutions (such as for welding, gluing or dosing applications), dedicated robot controllers and accessories. Usually, there is no way to order the robot mechanics separately from the robot controller.

More and more machine and plant builders, however, do not want to buy mechanics and controllers in a bundle – and are looking for alternatives. The reason is simple: Having separate controllers for robotics and machine control adds time and cost throughout engineering, commissioning and maintenance, as well as spare parts storage. In addition, latency times at the interface between robot and machine controller can make it more difficult to synchronize robot movements with machine processes, such as the movement of a conveyor belt.

Controller-agnostic robot kinematics

Suppliers like MAJAtronic are stepping up to fill this gap in the market. A subsidiary of MAJA, a German manufacturer of machinery for the food industry, the company has developed a portfolio of around 150 different delta and DuoPod systems since it entered the market in 2010. These feature working areas ranging from 20 to 200 centimeters and handle nominal payloads from 0.5 to 350 kilograms – including a delta robot with a 50-kilogram payload capacity. The special feature of all MAJAtronic robots: The robust robot mechanics are offered without a controller, drive or other accessories under the brand name Autonox24.

To make it as easy as possible for their customers to integrate "Made in Germany" robot mechanics into their machines and systems, MAJAtronic works closely with control suppliers like B&R with years of experience

Hartmut Ilch
Co-founder and Managing Partner, MAJAtronic GmbH

"Our new articulated-arm robot was up and running in only four hours. It was absolutely amazing. B&R clearly occupies a leading position among control manufacturers."

delivering controllers with the necessary performance. The robot manufacturer recommends motors for each controller. That way, users don't have to lay out the motors themselves or can start with a tested combination and make optimizations from there.

In the field: 700 robots without dedicated robot controllers

This offer has already gained traction amongst quality-conscious machine builders, as MAJAtronic managing partner Hartmut Ilch proudly reports: "Today, more than 700 of our robots are at work in our customers' machines." A large portion of these are packaging machines used in the food industry.

That's where Autonox24 has its beginnings. The first robot developed by MAJAtronic on behalf of its parent company was a delta robot with a hygienic design. "It soon became apparent, however, that machine builders were enthusiastic about our controller-agnostic concept and also wanted robots for packaging and sorting in environments that did not require hygienic design," says Ilch.

Expanding the concept to include articulated arm robots

In recent years, there have been increasing calls for the company to expand its controller-agnostic concept to include articulated arm robots. The aim was also to be able to incorporate operations such as palletizing into the machine control framework. MAJAtronic took these requests to heart, and – with the support of four well-known pilot customers who had previously used robots with separate robot controllers – tackled the development of 6-axis articulated-arm robots.

The first two members of the resulting "articc" family are a 6-axis robot with a 20-kilogram payload and a 4-meter working area, as well as a smaller version with an 8-kilogram payload and 2-meter working area.

Robotics application with mapp Robotics

B&R has been on board with these new developments right from the start. Waldemar Salzsehler, application engineer at B&R's technical office in Heilbronn, Germany, programmed an endurance test for the first prototype of the 20-kilogram robot and an exhibition demo for MAJAtronic, with the help of B&R's Automation Studio engineering environment. The core of the robotics application was implemented using mapp Robotics, part of B&R's modular mapp Technology software framework. The mapp Robotics library comprises modular function blocks and data structures for robotics programming as well as predefined kinematic models. These contain all the information required for reverse transformation.

To create new kinematic systems, the B&R Scene Viewer tool provided in Automation Studio can be used to generate a model from the CAD data of the robot mechanics, including the transformation parameters. Users can perform virtual commissioning using this model in advance – observing and recording the movements of the robot – without any actual robot mechanics.

No need for specialist robotics know-how

mapp Robotics provides many of the core functions needed for a robotics application, such as starting the program, executing a linear movement, switching on all the controllers or homing the axes. Users without any special robotics know-how are able to implement these functions without having to program them from scratch.

Corresponding mapp components are also available for most other elements of a (robotics) control application, such as user management, alarm handling, a state machine or HMI application – the overall programming effort is substantially lower than with a conventional approach to programming.

Building on this foundation, the B&R application engineer began by modeling the kinematic system, creating the basic control and HMI applications and putting the robot into virtual operation – all in just under a week.

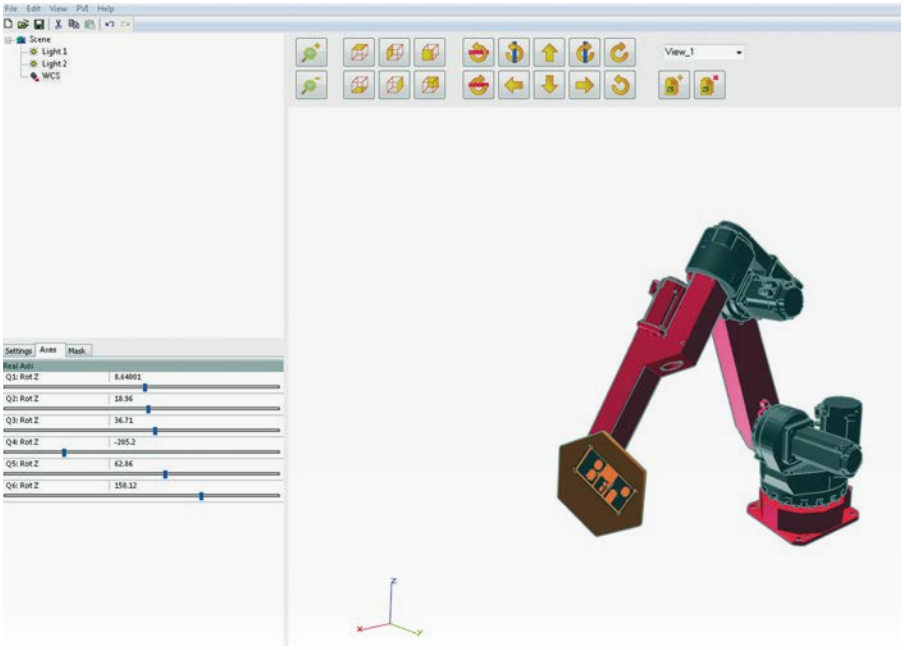
Commissioning in only 4 hours

Once the prototype was ready at MAJAtronic,

Photos: MAJAtronic, B&R

featuring the MAJAtronic robot mechanics and a B&R controller like the one used in one of the pilot customer's machines – the second step was to perform the actual commissioning of the robot. "The robot was up and running in only four hours. It was absolutely amazing," says Ilch. "We were immediately impressed by the short commissioning time and the quality of the path control. B&R clearly occupies a leading position among control manufacturers."

Including the NC programming of an endurance test, in which all positions are traversed and all axes are moved at maximum speed and acceleration, Salzehler spent a total of only three days doing onsite commissioning. He was able to reuse the modular solution he created to implement the 6-axis demo robot in only one day. The modular structure of mapp Technology makes it easy to expand the application as required and integrate things like conveyor belts or other machine components on the same control platform.



With the help of B&R Scene Viewer, models of the robot mechanics can be created easily and the robot movements can be displayed and recorded without any actual hardware. This allows the robotics application to be tested in advance and reduces the amount of time required for commissioning on the machine.

Sustained trend towards integrated solutions

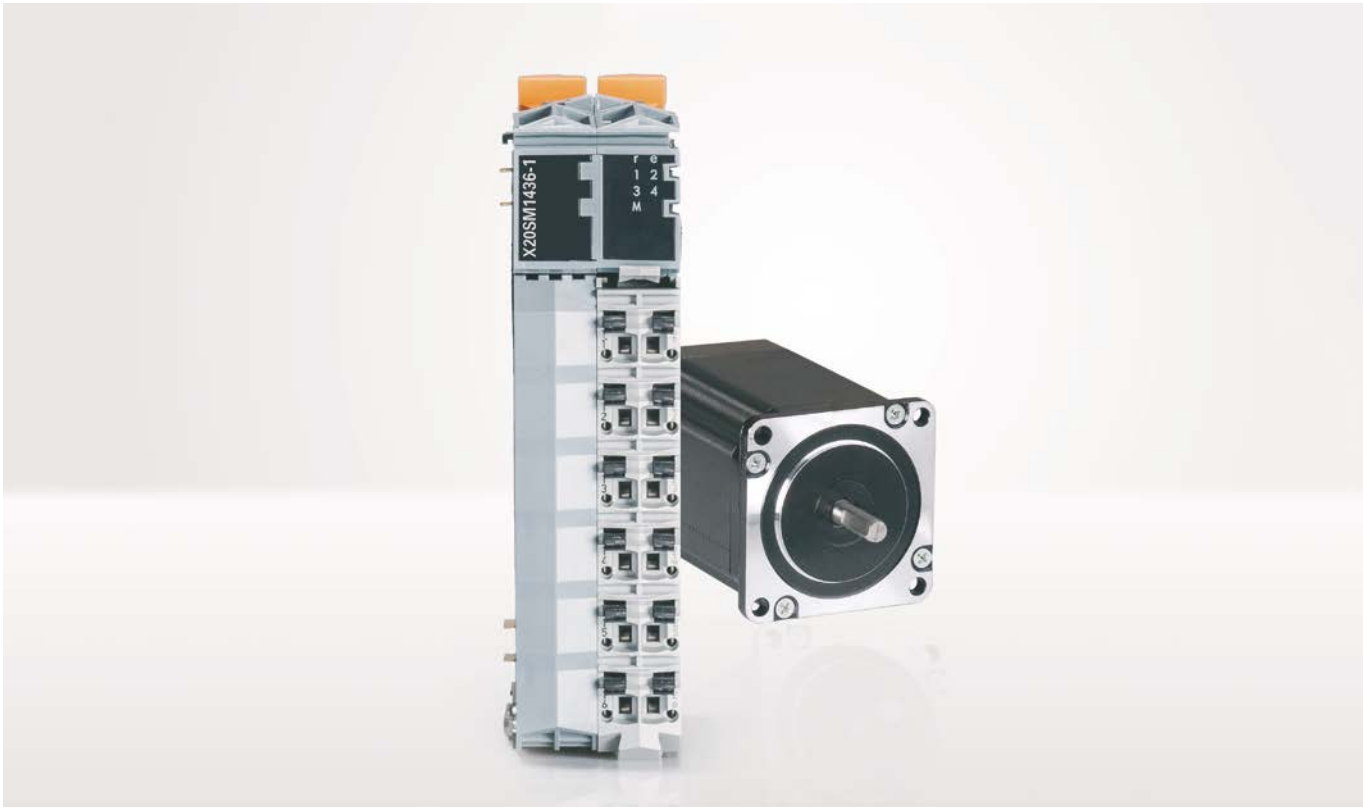
"Such tight integration of robots and machine components offers the ideal foundation for implementing Industry 4.0 concepts. It also has a positive effect on the performance of the entire machine," explains Ilch. "In a bench-mark demonstration, we were able to show that users can increase the performance of an existing system by a good 50% with our concept."

As a result, both the standard control manufacturer and the standard robot manufacturer were no longer involved. "Because of the impressive advantages of a controller-agnostic robot, we're going to be seeing this approach from more and more machine and plant builders," says the MAJAtronic manager, optimistic about the future. ←

The user interface for the demo robot was created with mapp View, mapp Technology's HMI solution. Based on the latest web technology, it can run on any browser-enabled device.

Photos: MAJAtronic, B&R

Save energy and increase performance



The new stepper motor module from the X20 series offers sensorless and load-dependent current control.

B&R introduces new stepper motor module from the X20 series

With the X20SM1436-1 module, B&R has added to its portfolio a new X20 module for direct control of stepper motors. The module can be used to operate stepper motors with operating voltages from 18 to 60 VDC at rated currents up to 2.5 A. In addition, the integrated current reduction function increases performance and reduces energy consumption. With the current reduction function, B&R has integrated sensorless, load-dependent current control, which significantly increases the performance of the module. Double the rated current can be provided for short periods of time. By regulating the current downwards depending on the operating situation and load, the module allows energy savings of up to 75 percent.

Smoother operation

The current reduction function also significantly reduces power dissipation and heat accumulation in the module. At the same time, current control also results in the stepper motor running more smoothly. For self-protection, the stepper motor module has an inrush current limiter and a motor outlet with short circuit and overload protection.

Digital inputs with open circuit monitoring

The module has four digital 24 VDC inputs. Three of them can be configured as ABR encoder inputs with a counter frequency of 1 MHz for 4x evaluation. In addition, all digital inputs have open circuit monitoring, which increases operational security. To detect slippage, the module has been equipped with stall detection.

Photo: B&R

Thesis project

WaterStop

Have no fear, the water damage solution is here. Alexander Brader and Lukas Brünner, two mechatronics engineers at the HTBLA Braunau technical college, developed a device as a part of their thesis project that quickly and easily prevents unintentional water loss in a cost-efficient manner.

Photo: iStock

Lukas Brünner and Alexander Brader (from left to right) submitted the project titled "WaterStop" for their diploma thesis. Lukas focused more on the software aspects of the project, while Alexander kept an eye on the mechanical components.

The motivation for this invention is simple: The systems that are currently on the market are too expensive and difficult to install. The HTL Braunau graduates therefore set out to develop an inexpensive device that operates reliably and is easy to install in a home's existing plumbing system.

Stepping up to the challenge

Obtaining an exact measurement of the water flow and creating a water use profile weren't the only challenges the developers faced: The project was also to include an HMI application suitable for use by the average homeowner that also allows data to be accessed remotely via a web server. With the appropriate hardware and an intelligent program, Alexander Brader and Lukas Brünner developed a reliable device that prevents water damage. "Water faucets that have been left on by accident or gradual leaks that aren't noticed until the damage has already been done are now things of the past," explained Alexander Brader during the launch of the thesis project at HTL Braunau.

A glimpse inside WaterStop's aluminum housing reveals the components provided by B&R.

Markus Brückl
Human Capital - Education Network, B&R

"The students receive all the hardware and software needed for their project from B&R."

Photos: B&R

The students with their advisors (from left to right): Anton Deschberger, Lukas Brünner (back row), Alexander Brader (front row) and Albert Schmeitzl (Software).

Thomas Dicker
Human Capital - Education Network, B&R

"B&R provides support to students working on their thesis projects. The idea often comes from the person working on the project, but there are also projects that are proposed by B&R."

Water damage is a thing of the past

For their thesis project, the two graduates developed a reliable system that can distinguish between regular and unintentional water usage and, in the meantime, have also registered the system as a utility model. "When an incident is detected, the water flow is stopped to prevent further damage and avoid the high cost and inconvenience of repair work," say the developers, explaining how WaterStop works. "The built-in flow meter is connected to a solenoid valve and sends a continuous flow of data to a B&R C70 controller. If the controller detects a deviation from the specified profile, the solenoid valve is closed," notes Brünner. The C70 controller has a built-in 5.7" display, is extremely compact, has a wide range of connection options and is easy to program.

Before the students began their project, they consulted with B&R employees Thomas Dicker and Markus Brückl. Together with their advisors, Albert Schmeitzl and Anton Deschberger, they arranged the necessary hardware components. One of the greatest challenges for the two young technicians was the commissioning process. They mastered the challenge brilliantly, however, with professional support from their advisors and the helpful training at the B&R headquarters in Eggelsberg.

Keeping the installation process as simple as possible

"One of the highlights of our project is easy installation. Our custom-built aluminum housing is connected to the main water pipe and does a reliable job of securing the entire house. Our development provides a high degree of security, especially for apartments and houses that are only occupied intermittently," says Brünner. Lukas Brünner examines production and marketing possibilities with his project partner. The dimensions of the device also need to be adapted to the standard installation dimensions of a water meter. The graduates want to take advantage of this interface, because it is already permissible in Germany to replace one calibrated water meter with another.

Recognized by the WKOÖ

At the annual ideas competition hosted by the Upper Austrian Chamber of Commerce and the local newspaper, "Bezirksrundschau", the WaterStop project was voted among the top 10 from a total of 90 HTL projects. ←

Education Network

B&R's Education Network program promotes cooperation between technical training centers, technical collages, universities and B&R. Regardless of whether a project is a final thesis project, a public project or an internal one, it receives support from experts in every discipline of automation technology. B&R provides the necessary hardware and custom seminars at particularly favorable prices – in some cases providing them free of charge for the duration of the project.

B&R joins Huawei's OPC UA TSN testbed

The new OPC UA TSN testbed was introduced at the Hannover Messe.

Practical testing for seamless smart factory communication

B&R has joined the OPC UA TSN testbed of Chinese network equipment vendor Huawei. The Austrian automation specialist is now participating in all three of the world's most significant platforms for practical testing of the new communication technology. The two other testbeds are those organized by the Industrial Internet Consortium (IIC) in the USA and Labs Network Industrie 4.0 (LNI) in Europe. "Huawei's testbed gives us the opportunity to advance the standardization of OPC UA TSN in Asia," explained B&R Marketing Manager Stefan Schönegger during the presentation of the testbed at the Hannover Messe. "In doing so, we're making another important contribution toward globally harmonized industrial communication."

From the sensor to the cloud

Huawei's testbed will feature an OPC UA TSN network simulating all aspects of smart factory communication – from individual sensors to the ERP system and on into the cloud. Data will be transmitted exclusively via OPC UA TSN – regardless of whether it is real-time motion control data or aggregated performance metrics for executive management. There is no need for communication interfaces of any kind.

Photo: Huawei

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