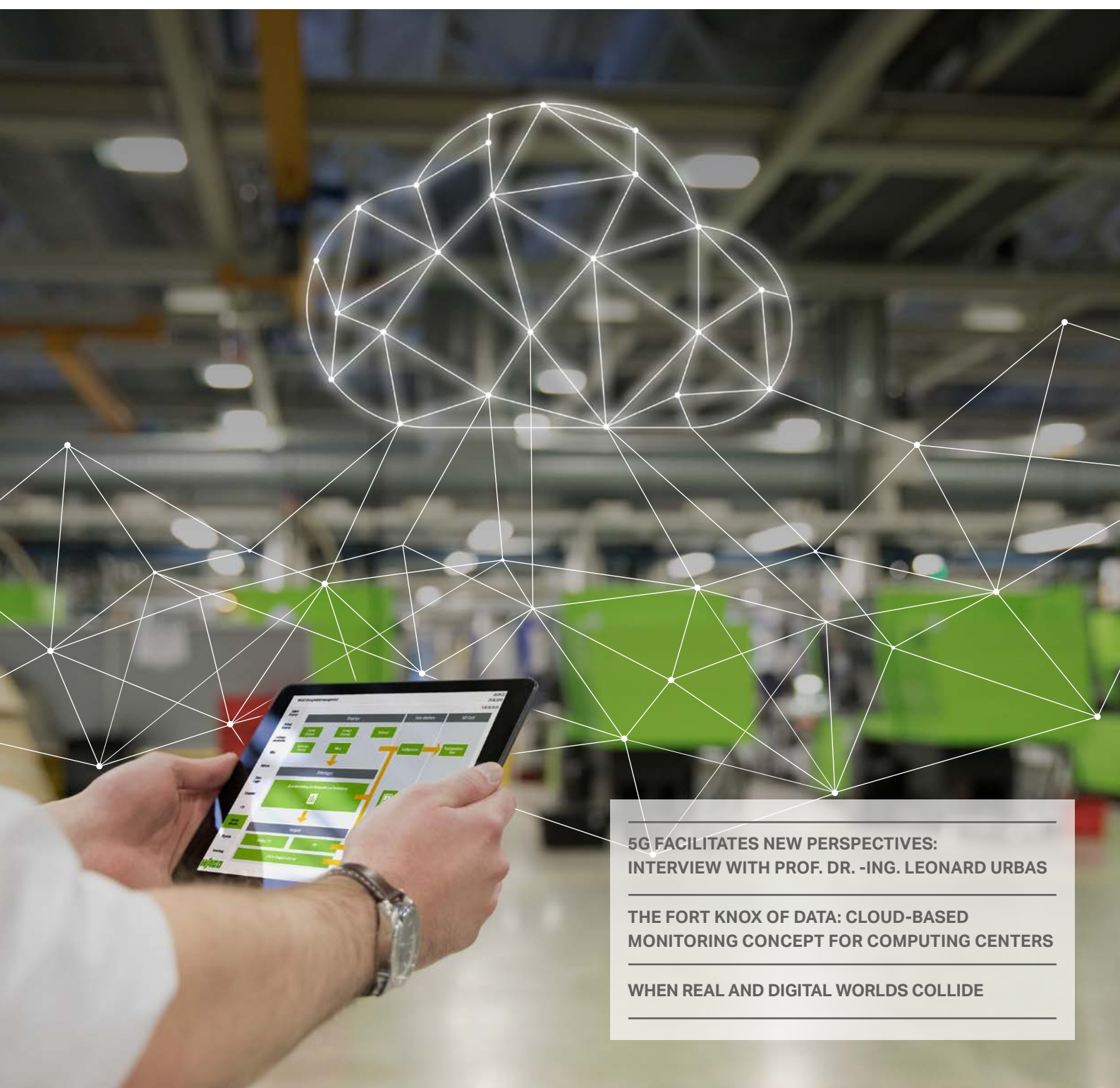


## Creating Value

From the Cloud to New business Models



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**5G FACILITATES NEW PERSPECTIVES:  
INTERVIEW WITH PROF. DR. -ING. LEONARD URBAS**

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**THE FORT KNOX OF DATA: CLOUD-BASED  
MONITORING CONCEPT FOR COMPUTING CENTERS**

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**WHEN REAL AND DIGITAL WORLDS COLLIDE**

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# CONNECT THE WORLD OF AUTOMATION WITH THE INTERNET OF THINGS



## The WAGO PFC200 – Move Securely Beyond the Field Level

- Freely programmable Linux® operating system
- High-performance controller with integrated 3G modem and standard mini-SIM card
- Wireless data transmission over great distances
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**WE  
INNOVATE!**

**WAGO**



## EDITORIAL

### Writing Common Histories

**Dear Reader,**

Werner von Siemens' discovery of the electro-dynamic principle 150 years ago changed the world – and thus human life – irrevocably. However, several years passed before electricity was available for industrial applications, or indeed for everyone. It was only with Thomas Alva Edison's commercial development of direct current that electrical power became domesticated. Initially, however, the invention was greeted with skepticism instead of euphoria. Many of Edison's contemporaries considered electricity to be mysterious, fear-inducing hocus focus that was anything but safe. This attitude, however, belongs to history. For us, electricity is a given and the basis for modern life. We have learned to use, value and respect it.

Today, we stand before a similar, fundamental change, which will alter the world just as comprehensively. The way we communicate has already shifted. Technologies, proven successful over decades, have been surpassed. Small electronic devices, such as smartphones and tablets, have become daily fixtures in our lives that go everywhere with us.

Thanks to modern information technologies, like the cloud, information is available everywhere and at all times. The change has occurred, with people quickly becoming accustomed to using the cloud for private use – storing photos, music and videos for access as needed – however, professional applications have fallen behind.

The primary reason is related to security, which provokes skepticism. Just like electricity, the cloud has to battle misconceptions and safety concerns: The same fears have resurfaced in the industry regarding reliability, safety, dependability. And this brings the circle back around, begging the question: What have we learned from history? We have accepted the risks that are part of electricity in order to benefit from its advantages. This trend will also play out in the adoption of cloud technology. Contractual frameworks, legal requirements and IT security measures will provide maximum security. The fear of a possible 'electric shock' will, however, remain, and must be confronted by the numerous advantages.

We have already seen that companies are gradually implementing cloud-based solutions, because the advantages are overwhelming. Large investments are not necessary to profit from the cloud's flexibility. Thus, small- and mid-sized corporations, for example, can participate directly, offering services to their customers that previously only large companies could provide.

This edition of **WAGO DIRECTINDUSTRY** introduces the technological potential of cloud connections and their possible uses in industry. We are always available for a more in-depth conversation.

Best regards,

**Frank Schmid, M&M Software GmbH**



## COVER STORY

### Using the Cloud to Arrive at New Business Models

Industry 4.0 and big data open up unexpected possibilities for manufacturers and lay the groundwork for promising business models – therefore, increased data protection is necessary. Flexible and intelligent technical solutions that collect data at the field level and provide it to the cloud will establish this foundation. These solutions are the object of increasing attention for linking machine-to-machine communication, as well as networking machines with the entire organization in order to process and analyze newly gained information density. This is the only means for actually leveraging the new optimization potentials – and creating added value.



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The DIMA concept for modular automation wins over jury of experts and industry specialists.

# WAGO WINS THE "INDUSTRY 4.0 INNOVATION AWARD"



Ulrich Hempen, Thomas Holm and Sven Hohorst (WAGO) accept the award from Ronald Heinze (Chief Editor at VDE-Verlag).

With DIMA (Decentralized Intelligence for Modular Applications), WAGO has developed a concept that supports the highly adaptable production processes required by Industry 4.0. For its revolutionary approach, WAGO was recognized as an industry leader with the “Industry 4.0 Innovation Award” bestowed by the VDE (German Association for Electrical, Electronic & Information Technologies) publishing house in cooperation with ZVEI (German Electrical and Electronic Manufacturer’s Association).

“Due to globalization and customization, products have to be developed and manufactured more quickly. Today’s production systems are, however, limited in their ability to handle this type of manufacturing. What is needed are production systems that are dynamically adaptable. They can be implemented using modular production systems; however, this also requires modular automation. Yet up until now, there has not been any manufacturer-independent solution. The automation system had to be individually and manually programmed. With DIMA, we show how easily modular systems can be automated without extensive effort,” explains Ulrich Hempen, Head of Market Management Industry & Process at WAGO.

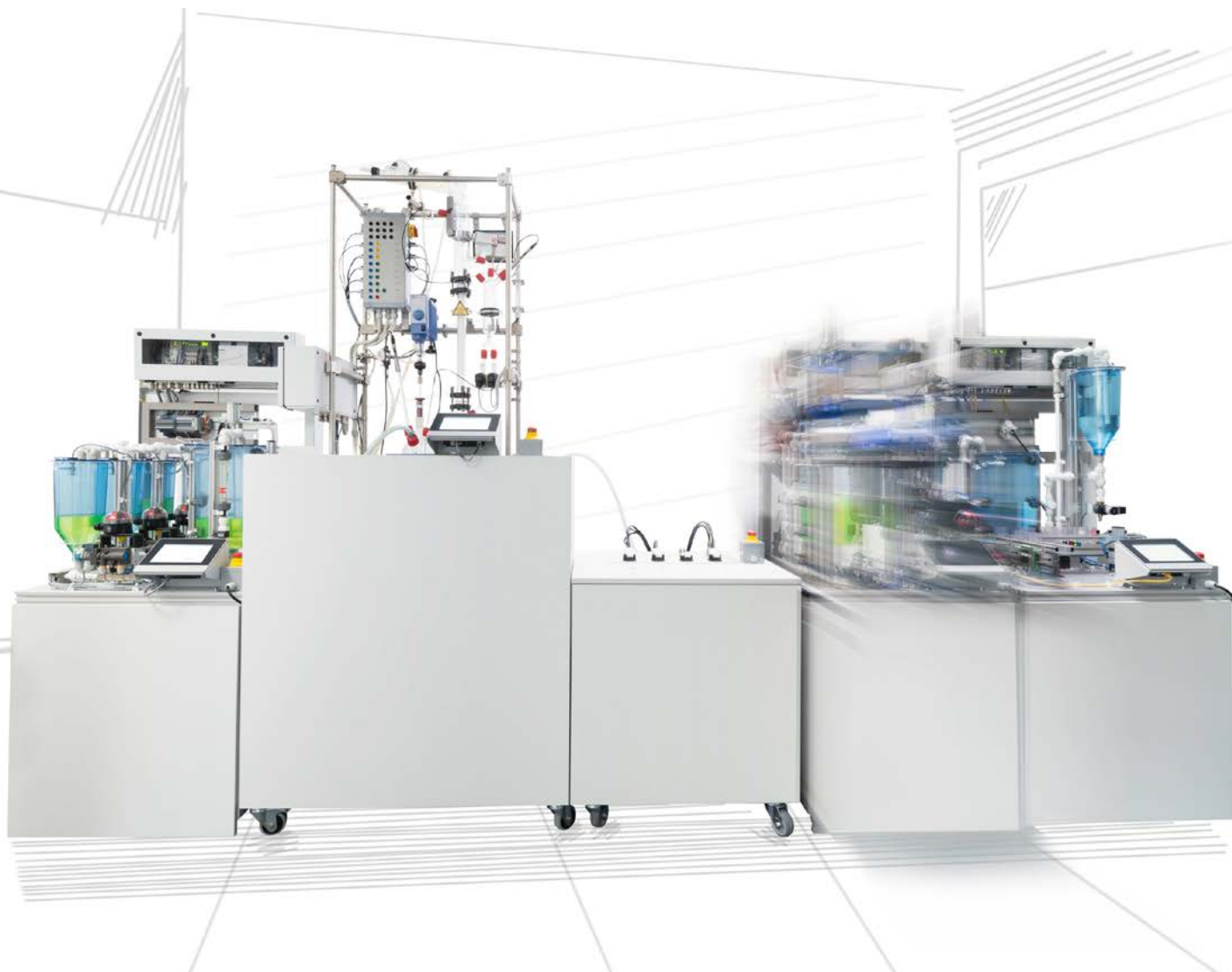
A five-person expert jury consisting of Angelo Bindi (Deputy Director Industrial Engineering, Continental Teves), Gunther Koschnick, (Managing Director of the Automation Association, ZVEI), Dr.-Ing. Olaf Sauer (Deputy Institute Director,

Fraunhofer IOSB), Prof. Dr. Dr. h.c. Detlef Zühlke (Scientific Director and Head of Innovative Factory Systems, DFKI), and Ronald Heinze, (Verlagsjournalalter, VDE VERLAG) selected DIMA as one of the 10 top products out of almost 50 submissions. This was followed by nationwide online voting sponsored by the VDE publishing house, in which WAGO’s DIMA concept received the most votes.

“User and manufacturer response to our concept has been very positive. The fact that we came out on top in this high-caliber competition with DIMA is further proof that we are on the right path toward Industry 4.0 with our modular, open automation approach,” emphasizes Ulrich Hempen. The “Industrie 4.0 Innovation Award” is not the first award that this concept has received. DIMA has already won the “Achema Innovation Award” from the industrial magazine Process, and the “atp award” from the “atp edition” publication. It has also recently won internationally, receiving the “Food Processing Award” from the British food and beverage industry.

## About DIMA

The basic idea of this modular system architecture: Combine properly equipped modules with integrated automation into an overall system with minimal effort. The manufacturer provides the fully automated module. Engineering for the entire system then consists solely of assembling modules and connecting them to the production control level.



Entire system modules can be exchanged in less than two minutes: In cooperation with the Dresden University of Technology and the Helmut-Schmidt University in Hamburg, WAGO has implemented a prototype to demonstrate the basic practicality of DIMA.

With DIMA, which is based on the NAMUR "NE 148" recommendation, WAGO has introduced a solution for modular automation with decentralized intelligence. The essential advantages for users are found in the system's open architecture. This method allows intelligent production modules to be flexibly integrated into or decoupled from a running system. In addition, DIMA enables cost-effective design of the entire system since communication between the higher production control level and the decentralized module occurs via manufacturer-neutral semantics.

DIMA shifts large parts of the control intelligence to the modules. These function as services that can be accessed by other communication users via a unified interface. The process for announcing

the services and operating images is not based on proprietary solutions, but rather, is performed via MTP (Module Type Package). It serves as a digital description of a system module and contains all the information required for integrating the module into the system and for operating it. This makes it possible to integrate a module, which is completely unknown to the higher production control level, within a few minutes.

TEXT TINA NOLTING | WAGO

PHOTO WAGO



# EPSITRON® – SINGLE-CHANNEL ELECTRONIC CIRCUIT BREAKERS

Superior security & superior speed

Currently the market's slimmest devices, WAGO's new *EPSITRON*® Series Single-Channel ECBs reliably protect your consumers from over-current and short circuits in a width of just 6 mm. The ECBs are available in 1/2/4/6 and 8 A models at 24 VDC for a wide range of applications.

The new *EPSITRON*® Electronic Circuit Breakers are ideal for secondary-side fusing with long lines or small cable cross-sections in which miniature circuit breakers and melting fuses cannot be triggered. Secondary fusing will trigger even in the event of a low over-current that falls within the EN 60204 conditions, making it possible to use a cost-effective basic network device – triggering occurs after just four ms in the event of a hard short-circuit.

This performance ensures that the system starts up smoothly – even under high load. WAGO's ECBs enable high-capacity loads greater than 50,000 microfarads to be switched on, requiring no additional measures. Changing the nominal current is also not necessary, which helps to reduce false tripping due to inrush currents.

## Versatile and Reliable

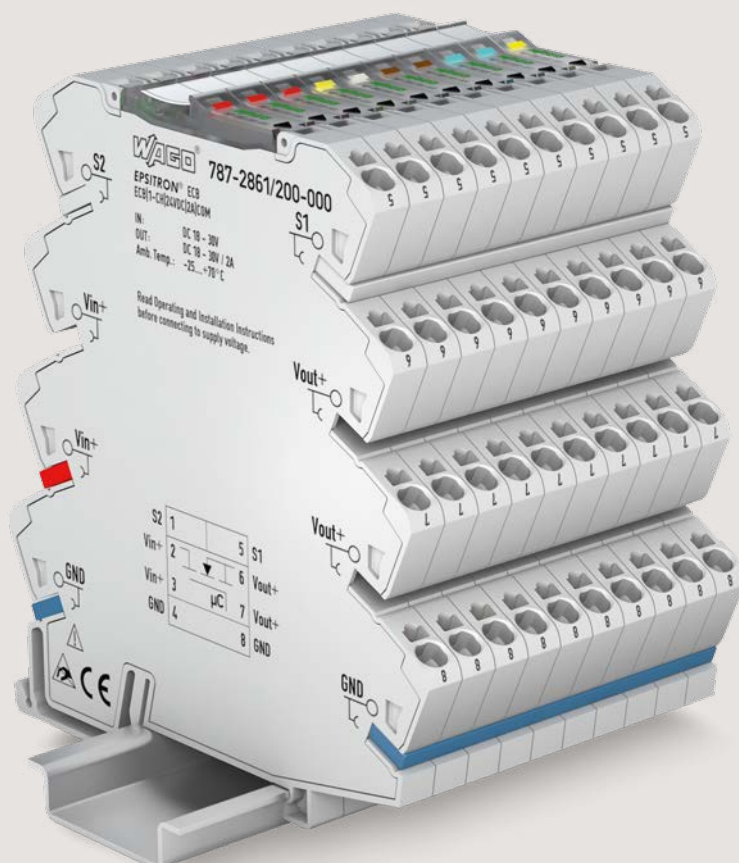
The ECBs can be used as electronic relays, due to their digital input, which allows resetting and on/off switching directly at the module or remotely via digital input signal. In mechanical engineering and systems applications, electronic circuit breakers are widely used to reliably shut down a ground fault in the control circuit within a defined period of time, as specified in EN 60204. ECBs are often chosen over melting fuses for equipment protection due to their high level of accuracy. Furthermore, ECBs can be reliably and flexibly used in ambient operating temperatures ranging from -25°C to +70°C – even under extreme conditions.

## Compact and Modular


WAGO's new ECBs are modular and enable direct input voltage commoning with minimum wiring, while ensuring simple input voltage connection to *JUMPFLEX*® 857 and 2857 Series units. Signal inputs and outputs can also be combined into sum signals by using jumpers.

Additionally, these new modules are just 6 mm wide, making them the slimmest ECBs currently available. They are 66% smaller than miniature circuit breakers, which saves even more space, particularly when used in switch cabinets.

Reliable and fast:  
WAGO's new *EPSITRON*®  
Series Single-Channel  
ECBs







From the Cloud to New business Models

# CREATING VALUE

Industry 4.0 and big data open up unexpected possibilities for manufacturers and lay the groundwork for promising business models – therefore, increased data protection is necessary. Flexible and intelligent technical solutions that collect data at the field level and provide it to the cloud will establish this foundation.



# 3,500,000,000,000

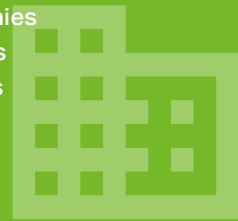
(3.5 trillion €) is the annual economic potential of the  
"Internet of Things" (IoT) in production.

(Source: McKinsey)



## 9

out of ten companies  
view IT security as  
critical to success  
(Source: VDE)



## 60%

of companies in Germany feel they are well  
prepared for Industry 4.0.  
(Source: McKinsey)

Networking continues to increase. Whether one considers smart houses, mobility or production, everything is networked and constantly provides data about the environment and processes. Software updates are implemented "through the ether," which eliminates the need for extensive maintenance or a trip to the repair shop, an example already shown by the eVehicle pioneer Tesla. Against this background, product development in the future will not stop at delivery, but will transform into a constant process – a decades-old convention in the software industry in which the key term is Continuous Delivery. Manufacturing will thus develop into a constant process, which will also continue after product delivery and must, therefore, be configured. The infrastructure in the background provides both the foundation for a long and maintenance-free service life of the product, and must also be constantly adapted and optimized. Every day, the world is becoming a little bit more digital. The increasing speed of development cycles correspondingly demands agile solutions on

the part of companies in order to remain competitive over the long term. Flexibility sells!

### IIoT\* – The "System of Systems"

Digitalization concepts, like Industry 4.0 in production, can create the necessary flexibility. Queries, which were previously processed in different machines and systems, will in the future be autonomously answered by a "system of systems," the network of product, process and resources. What should be produced in what amounts? Are replacement parts or materials needed? When should the delivery occur? This can even go a step further: In the factory of the future, all components in the production chain will be able to autonomously communicate with one another – across locations. The goal is networked production that is faster, more efficient, and more flexible, enabling individualized products while retaining high quality. The classic automation pyramid using conventional central controllers is gradually disappearing.

\*IIoT = Industrial Internet of Things



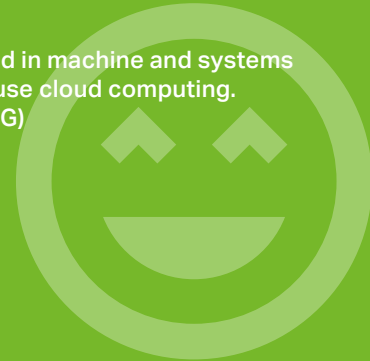


# 58%

worry about unauthorized access to sensitive corporate data.  
(Source: Bitkom/KPMG)

# 65%

of companies involved in machine and systems engineering already use cloud computing.  
(Source: Bitkom/KPMG)



# 1%

of the acquired data is actually used. (Source: McKinsey)



New information and communication technologies, like cloud services, 5G, OPC-UA with TSN, and flexible automation solutions are the future of Industry 4.0 and IIoT. These solutions are the object of increasing attention for linking machine-to-machine communication, as well as networking machines with the entire organization to process and analyze newly gained information density. Only in this way can the new optimization potentials be leveraged. These communication technologies enable monitoring, tracing and controlling of production processes via remote access. Examples include condition monitoring and predictive maintenance.

### Added Value through New Business Models

Previously, personnel, technology and capital were the critical factors for commercial business: now, data must also be included. However, while individual measured values are rather meaning-

less, the combination and contextualization of thousands of data sets within the framework of big data analytics allows for pattern recognition. The much-invoked added value thereby arises from the combination of different data sets, for example, the derivation of optimization potentials and predictions for processes. The possibilities are extensive, from energy management solutions through easy remote diagnostics up to predictive maintenance. Their potential for corporations extends past mere internal use. The success rate for these types of technological solutions is already quite promising – leading to higher production efficiencies and reduced operating costs. The evaluation and use of data has increasingly developed into an external competitive advantage. One thing should have become clear by now: The road to created value passes through these data. However, many companies use only a fraction of the available data. According to one example from the McKinsey study, "How to navigate digitization of the manufacturing sector," less than one percent of the data



generated by the approximately 30,000 sensors on a drilling rig are used to make decisions. Even in the automation sector, data are used almost exclusively for real-time applications and for fault detection. Yet, before they can even be used, they have to be available. The road to created value therefore also passes through the cloud. Yet how are our domestic corporations positioned with respect to the cloud? An answer appears in the "Cloud Monitor" compiled by Bitkom Research and KPMG: 65% of companies surveyed in the machine and system engineering sector were already using cloud computing. For 76%, the location of the server farms in Germany was a decisive criterion.

### On the Road to Success with Smart Solutions

The cloud is an essential technological "enabler" of Industry 4.0 and IIoT, providing inexpensive and easily scalable computing and storage capacities beyond one's own IT systems. It is a central component of the required technological infrastructure – the "technology stacks." After all, every smart product in the "Internet of Things" has three core elements in common: a physical component (mechanical or electronic parts), intelligent components (sensors, processors, or control units), and networking components (ports or antennas). "This triad opens up completely new application possibilities: for example, products that monitor themselves and their surroundings, provide insights into usage and features, and can be controlled by the user through remote access, for example, via mobile devices," explains Leon Urbas, Professor for Process Control Technology at the Institute for Automation Technology at the Technical University of Dresden. This combination in turn offers the potential for optimization and potential for further automation, because ad hoc adjustments are also possible due to remote maintenance. Consequently, the equation reads: Data control + remote control + optimization = automation. WAGO's PFC family of controllers form the link between the real and digital worlds. With their PFC controllers, WAGO offers harmonized software solutions, services and platforms, that users will need in the future. This includes the decentralized data acquisition at the field level and automation, as well as providing data via the cloud to facilitate new data-driven business models. Cloud connectivity solutions from WAGO, like the PFC100 and PFC200 with MQTT interfaces, provide a sufficiently high

security standard and a secure path to the cloud, for production and elsewhere.

### The Cloud – Enabler for Industry 4.0 and IIoT

Industry 4.0 uses the cloud as more than just a data collection point. It provides the backbone of the production chain in connection with physical production systems. It supports product and production databases, analysis platforms for evaluating the production processes, and intelligent production application in order to automatically control and optimize production machines during operation. This information is enriched with company proprietary data from ERP, CRM, and PLM and external data, like raw material and energy costs, traffic situations, or weather data. For industry, the advantage of cloud services with respect to classic, in-house IT lies in a higher level of flexibility, particularly in relation to the scalability of systems. In addition, costs can be saved due to simplified administration, because cloud service providers offer standardized basic structures, like hardware, operating systems, and networks. Under certain circumstances, applications are managed by the service providers and enable the industrial companies to focus more precisely on their core competencies. This applies, regardless of company size, the number of existing servers, and the amount of data. In the long term, however, the only successful companies will be those who work with each other, and not against each other, in their individual ecosystems. The trend of establishing proprietary platforms is already diminishing. Companies are beginning to seek cloud solutions that offer the greatest added value – which includes targeted collaboration with competitors. The goal: Developing services for all aspects of a product which all participants can use.

### Cloud First – Security First

During the trend toward digitization, the cloud has become domesticated, as it were, at consistently lower costs, due, to a large extent, to the variety of cloud services being offered. The reasons include the construction of large server farms and also increasing standardization through vendors like Microsoft, IBM, Amazon and Google. And yet many companies, primarily in the industrial production sector, still do not





want to employ cloud services in their business processes.

The "Electrical Engineering and Information Technology 2015" report on trends published by VDE shows that doubts about IT security form a substantial barrier to cloud services, both for current business usage and for Industry 4.0. This is also confirmed by Bernd Steinkühler, CEO of Correct Power Institute in Bochum, a technical service provider for server farms, "In many companies, distrust of excessive networking is widespread. The skepticism is, however, often greater than

the risk." Security concerns remain the greatest obstacle to the use of cloud technology, and Industry 4.0 makes IT security increasingly complex. "When discussing security topics, the focus is often only on confidentiality. This is because legislators have consistently insisted that information, often defined as personal data, is "to be protected" from undesired access. However, when looking at Industry 4.0 and its massive information densities and IT networking, the scope of protection is extended to corporate proprietary expertise, like product information and machine configurations," according to Steinkühler.





The cloud penetrates all aspects of our lives, whether in production, energy generation, infrastructure or smart houses.

Protecting these unique selling points forms the central condition that must be met prior to the use of cloud services in production, and without impairing processes and quality. This is reflected by the 2016 VDE report: 58% of the surveyed companies indicated serious concerns about unauthorized access to sensitive corporate data. Some 45% reported the risk of data loss as a reason for increased skepticism. In the case of complete networking, corresponding security concepts must be established as a matter of course in each digitized corporate division.

However, security must extend beyond the responsibility of the IT department and must be comprehensively planned. The challenge of introducing cloud structures into production processes is not a technical problem, but is revealed as a strategic move. Therefore, a path must be selected which enables use of cloud technology advantages without sacrificing robust security measures.

**TEXT** THOMAS HOLM AND NILS WIGGER | WAGO

**PHOTO** WAGO

Cloud-based Monitoring Concept for Computing Centers

# THE FORT KNOX OF DATA



If hackers or a technical glitch paralyze the servers of a corporation, the failures can lead to millions in damage. One company, Correct Power Institute, has developed a method for monitoring computer centers that quickly traces faults in the power supply to maximize uptime for the IT systems. The approach: Controllers from WAGO detect all electrical current and environmental data and use the cloud for analysis. The hardened Linux® operating system in the WAGO controllers and Correct Power's sophisticated security architecture ensure the highest level of data security.



Imagine an automotive manufacturer in Stuttgart: In the middle of the morning shift, production suddenly stops. Belts stop, the swift movements of the parts robots freeze, the touch screens for the production engineers go dark. Later, it becomes evident that cyber criminals attacked the manufacturer's computing center and cut the power supply to the servers. In places where Industry 4.0 has been implemented, where the most important processes are controlled via IT, this is an expensive experience: It is estimated that the company would have to absorb 20 million Euros in losses due to this production stoppage.

This example may be invented, but it is also quite real, as almost all of the large-sized companies, banks and insurance groups are outsourcing their IT to computing centers. These constantly process, analyze and store data, and often in the cloud, which provides enormous additional IT capacities. Yet therein lies the rub: Server farms can be easily attacked via the Internet if their IT security is not robust. Hackers increasingly exploit these weak points to infiltrate viruses into code, steal data, or cripple the power supply.



"Power supplies are the Achilles' heel of servers," explains Bernd Steinkühler, CEO at the Correct Power Institute GmbH. The company from Bochum, Germany specializes in constructing and monitoring server farms. The problem: Even though electrical supplies are regulated by standards and requirements, these are often not fully implemented. "There are many rules and regulations, and it is easy for operators to lose track. Monitoring is often lacking, and problems are not detected early enough," states Steinkühler. This can have fatal results for a company. If IT does not work around the clock, then production and competitiveness are negatively impacted.

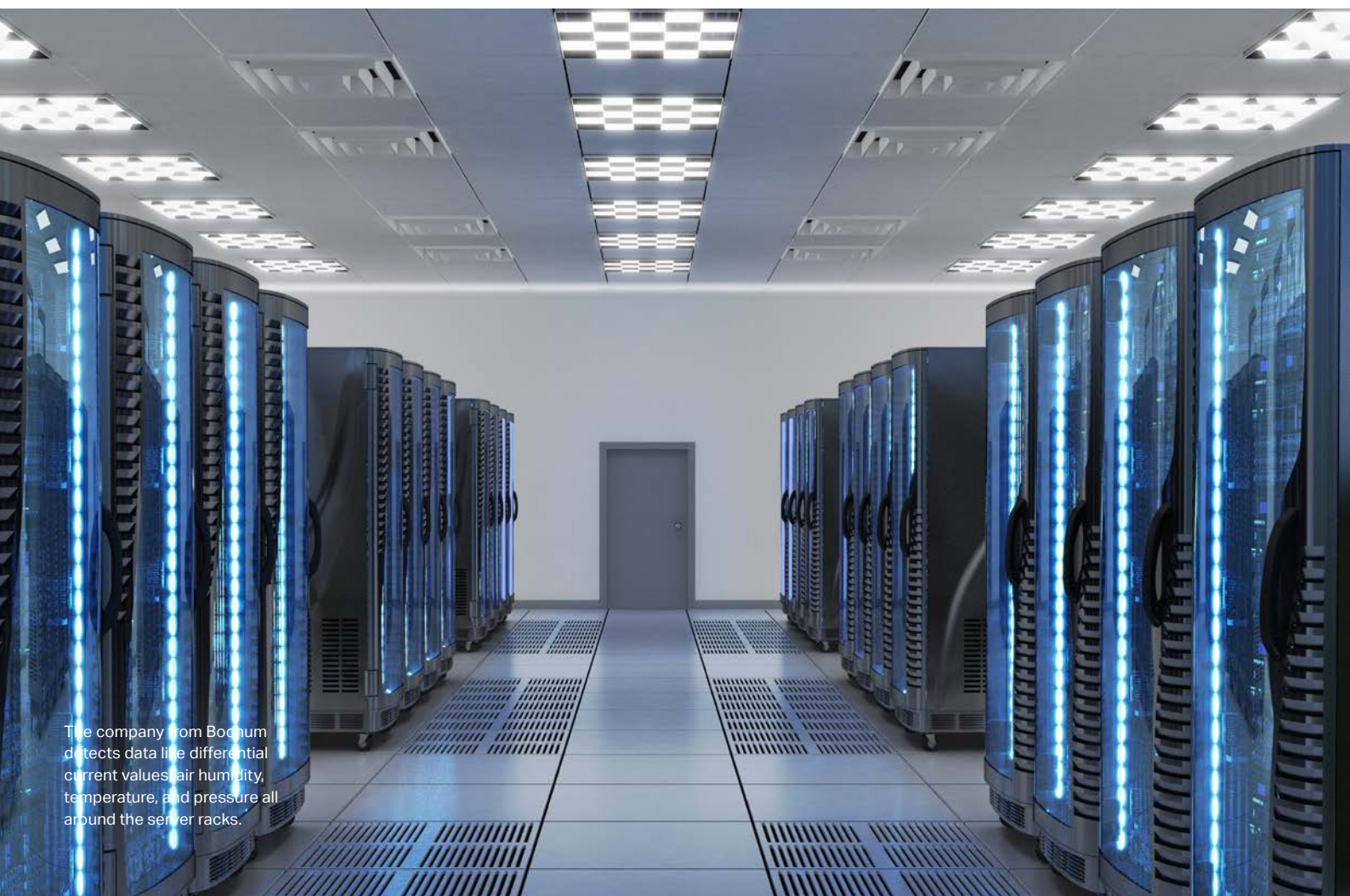
### Analysis in the Cloud using Azure

Correct Power can provide remedies: The company has developed a monitoring concept for server farms that targets maximum power availability. "To meet the demands for availability and security in modern computing centers, we have to examine the electricity more explicitly in order to detect and evaluate the residual currents in greater detail. We test the current extensively,"

explains Marcel Steinkühler; he is in charge of Sales and Marketing at Correct Power.

Controllers from WAGO play an essential role. They collect current and environmental data from up to 15,000 data points per server farm and send them for analysis and archiving to Microsoft's Azure platform, which is in turn managed by the Telekom subsidiary, T-system. "This provides us with concentrated big data intelligence. In addition, Azure offers a high level of data monitoring, because T-system functions as a German trustee to control access," according to CEO Bernd Steinkühler.

Differential current values, which are detected in the server racks at the computing center, form the basis for Correct Power's analysis. Differential current is, per definition, the vectorial sum of the currents of all active conductors at a specific point in an electrical system. Because the currents flowing in and out of the racks have to be balanced, this should be equal to zero. "When deviations arise, there is probably a fault, and our system sounds the alarm," explains Steinkühler. The company



The company from Bochum detects data like differential current values, air humidity, temperature, and pressure all around the server racks.



*»Problems often result from unfavorable correlations. We want use artificial intelligence, known as machine learning, to detect and prevent errors.«*

also monitors environmental values, like humidity, temperature, and pressure. If it becomes too hot in the server rooms, the sensitive servers operate at reduced output and increased power consumption. In such cases, the temperature is automatically regulated by the climate control systems and the cloud sends a warning message.

It all sounds easy; however, it is based on a sophisticated system. The specialists at Correct Power considered data security extensively in their design. "Many marketable controllers simply do not offer what we need in this regard," states Steinkühler. These controllers are based on Windows and thus require regular security updates. "This is linked to an enormous expense and does not fit our high security requirements." Therefore, Correct Power selected the PFC200 Linux® controller from WAGO. "Security by Design" – IT security integrated from the outset in the form of layer-based security architecture – ensures that data thieves will have serious problems with these controllers. "We are enamored by the hardened Linux® operating system," opines Steinkühler.

### Core of the Security Chain

The Bochum company's designers cannot conceive of their concept without the PFC200. It automatically transfers selected values at defined intervals to the firewall of Palo Alto Network, a security firm. Communication is secured by an encrypted VPN connection using the proven MQTT protocol. Palo Alto evaluates the information, detects intruders, and repels attacks from the IT. They subsequently pass the "clean" values via the Internet to Azure for further cloud processing "Due to this intermediate step, our monitoring solution has become the Fort Knox for data," says Steinkühler.

The "Asset Management Cloud," developed by the WAGO subsidiary M&M, receives the data through Azure (also see page 30). A Web portal serves as the user interface, what allows adjustments to be made, for example, regarding what information is eventually stored in the cloud or which measured values will trigger alarms. The information can be clearly displayed in the

*»We are  
enamored by  
the hardened  
Linux<sup>®</sup> operating  
system in the  
PFC200.«*



Fabrice (left) and Marcel Steinkühler (right) make no compromises where data security is concerned.

forms of tables and diagrams on a dashboard and in the data warehousing database supported by Correct Power. "The good thing about the solution is that we have access to current and historical data, regardless of location," explains Steinkühler.

Industrial firms, banks and insurance companies have displayed interest in Correct Power's monitoring systems. They have already been implemented by IT specialists in twenty server farms across Europe, Asia and Australia, and are to be provided in ten others. As their next project, Correct Power is planning to use Azure for failure prediction and to develop new operating strategies for increasing the availability of the servers. "Problems often result from unfavorable correlations. We want use artificial intelligence, known as machine learning, to detect and prevent errors," explains Steinkühler.

Experts see important topics for the future in machine learning and neural networks, because with their help, it will be possible to use energy consumption and process data for predictive maintenance. Production systems will no longer be repaired when they fail, but before they do. This will prevent long idle times and the associated costs. WAGO can also facilitate a step in the direction of Industry 4.0, because their controllers can be used as central data managers for analog and digital information with secure links to the cloud.

**TEXT** MARTIN WEIßMÜLLER AND SASCHA RENTZING | WAGO

**FOTO** CORRECT POWER INSTITUTE, WAGO, Fotolia

# “Hackers Constantly Challenge Us”

Bernd and Marcel Steinkühler from Correct Power Institute, an IT firm, discuss attacks from the Internet and potential defenses.

## Should a company simply expect that cyber criminals will attack?

» **Bernd Steinkühler:** When a location like a computing center goes on line, hackers attack, statistically speaking, within two minutes. If the criminals succeed in interrupting the power supply, they can incapacitate the company. However, it often happens, that the hackers call using a disposable cell phone and say, “You will pay X amount or you will be finished in five minutes.” As a rule, companies generally pay. «

## What drives hackers? Does Bank A engage them, and pay them to attack Bank B?

» **Bernd Steinkühler:** *Most often, Chinese or Russian corporations hire hackers to damage their competitors. This is professionally organized, which is*

why the extorted companies generally pay without thinking too long or too hard. They know that their electricity can actually be cut off after ten minutes. «

## It is really that simple?

» **Marcel Steinkühler:** It’s even easier: A head manager leaves the company cell phone in a taxi; the driver finds it and sells it to a criminal, who uses it as a gateway past the corporate firewall. This happens faster than you think – the entire company network can be crashed within minutes. Cell phones are currently the main access point. This is currently a scam affecting London’s banking sector. «



Securing computing centers:  
Bernd (left) and Marcel  
Steinkühler (right).



Bernd Steinkühler is the CEO of the Correct Power Institute in Bochum; his son, Marcel, is responsible for sales and marketing. Correct Power was founded in 2004 as a private, independent scientific institute for technical security and smart energy applications. The headquarters of the Correct Power Institute is located in the Technology Center Ruhr on the

campus of the Ruhr University. Internationally active, Correct Power offers a broad spectrum of services in the area of scientific automation and data center technologies. The company offers product lines that are individually tailored to a customer, or bundled as aggregates specific to a respective company, and thus can be used by small corporations and large concerns.

**Do companies handle their data carelessly?**

» **Bernd Steinkühler:** They don't always know what can happen. The greatest threat is casually connecting devices to the Internet. If sensitive architecture is behind that device, like, for example, a water treatment plant, then this carelessness can have severe consequences. If hackers shut off the pumps, then several thousand people suddenly have no water. This is why penetration tests are important in order to find the gaps in the architecture. Yet until recently, these tests have not always been consistently performed. Reconsideration of this casual practice is gradually being established at more companies, and IT security is gaining importance. For banks, it has become the most important topic. The entire architecture being developed there is IT-secure. As service providers, we secure the transport paths for the data, in that we rigorously apply encryption. This means there are no attack vectors in the open Internet. «

**If someone wanted to, could they 100% protect themselves against cyber attacks?**

» **Bernd Steinkühler:** We have to be honest here: Hackers challenge us every day, and there is no 100% level of security. Every system has a weakness, regardless of how well it is designed. However, if a company places an emphasis on IT security and employs one hundred people to ensure it, then hackers will only succeed with a great deal of effort. One person, on the other hand, has no chance against them at all. We have incorporated numerous obstacles in our system for monitoring server farms: We rely on encryption and intrusion detection, which means that we also watch the traffic in our protected network. If we detect suspicious patterns, then the data packets are rejected and not transported any farther. This also helps us learn whether there are security gaps and where they are. In addition, our architecture is designed so that only certain servers, not all of them, can access the infrastructure to be monitored. Employees have to log in using two-factor identification, and they only see things virtually. They are never physically in the same room as the computers. This is essential: Everything must be concealed so that it cannot be attacked. «

**How long does it take to establish a security concept?**

» **Bernd Steinkühler:** It took us two years for Ernst & Young to certify our architecture, and the optimization process is ongoing. We had 51 findings in the first attack during an Ernst & Young penetration test. Of course, we then attempted to remedy them, but after the 13th finding, there was no solution possible, because there were simply too many gaps and they could not be closed. We had to accept that there were too many systems in use that were not secured against penetration. Therefore, we completely overhauled the architecture; the simple explanation is that we built a high wall around it with encryption and netscalers that also function as firewalls: All Websites that can link outward are screened again. Our security architecture resembles a fort with only a few gates leading outward. And they are carefully monitored. «

**You have companies from different sectors as customers. Is there one security solution that can be used as a blueprint for everything?**

» **Bernd Steinkühler:** It always has to be individually checked. The correct concept is ultimately oriented in how the data are supposed to emerge from the computing center. The various possibilities must be incorporated together with the customer's security department. In addition, several standards and norms apply. BSI baseline protection is considered the bible of IT security. When it is taken into consideration, then at least a basic protection level has been achieved. The rest must be adapted to the individual requirements. «

**What roles do WAGO controllers play in your security concept?**

» **Bernd Steinkühler:** Decisive ones. PC-based operating systems have to undergo weekly security updates, otherwise they do not offer sufficient IT security. Patches aren't required for WAGO controllers because they are based on a hardened Linux® operating system – the security is thus virtually built in. In addition, the WAGO controllers have two interfaces, so the application level and the management level can be separated from one another – which is also an important security feature. «

Bern Steinkühler (left) values the security and flexibility of the Linux®-based WAGO controller.



» **Marcel Steinkühler:** And you cannot forget that PC-based systems have USB interfaces. These are the worst, from a security point of view. If you insert one infected flash drive, then the virus will immediately propagate on your system. It is hard to believe, but this happens all the time during tours of computing centers: someone gains access to the servers, the server rack is opened, and it's all over. The Stuxnet computer worm got into the network via USB flash drive and manipulated control computers at industrial facilities worldwide. These types of problems can be prevented with the right security features. «

#### And now Industry 4.0 is knocking at the door.

» **Marcel Steinkühler:** The dangers posed by hackers could be immense. If we combine the raw material supply, the factories, the entire manufacturing process (which, of course, is the goal), and do not

simultaneously expand IT security, then entire corporations could be brought down. This is the reason why our monitoring applications run in the German cloud. Security is virtually built in by the architecture. «

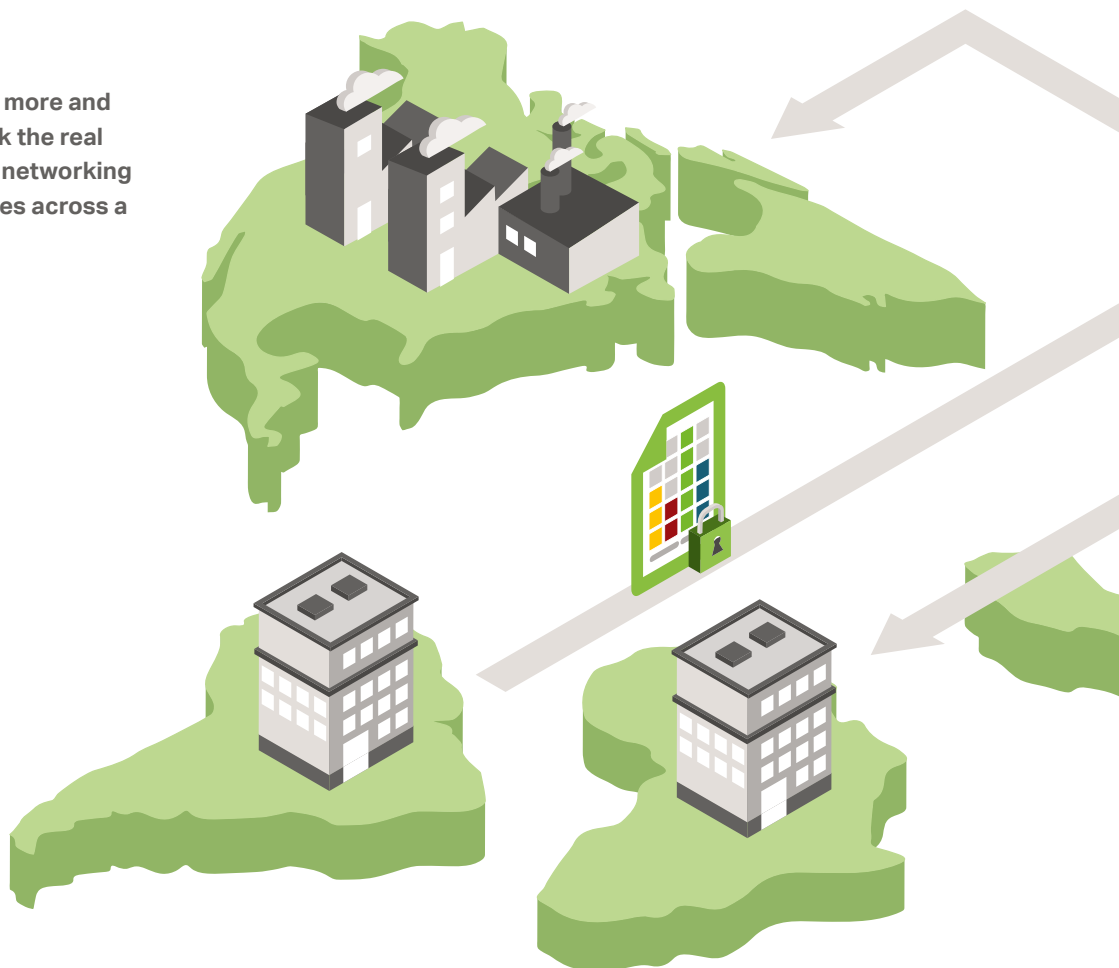
**Thank you for the conversation.**



# IT'S EASY IN THE CLOUD

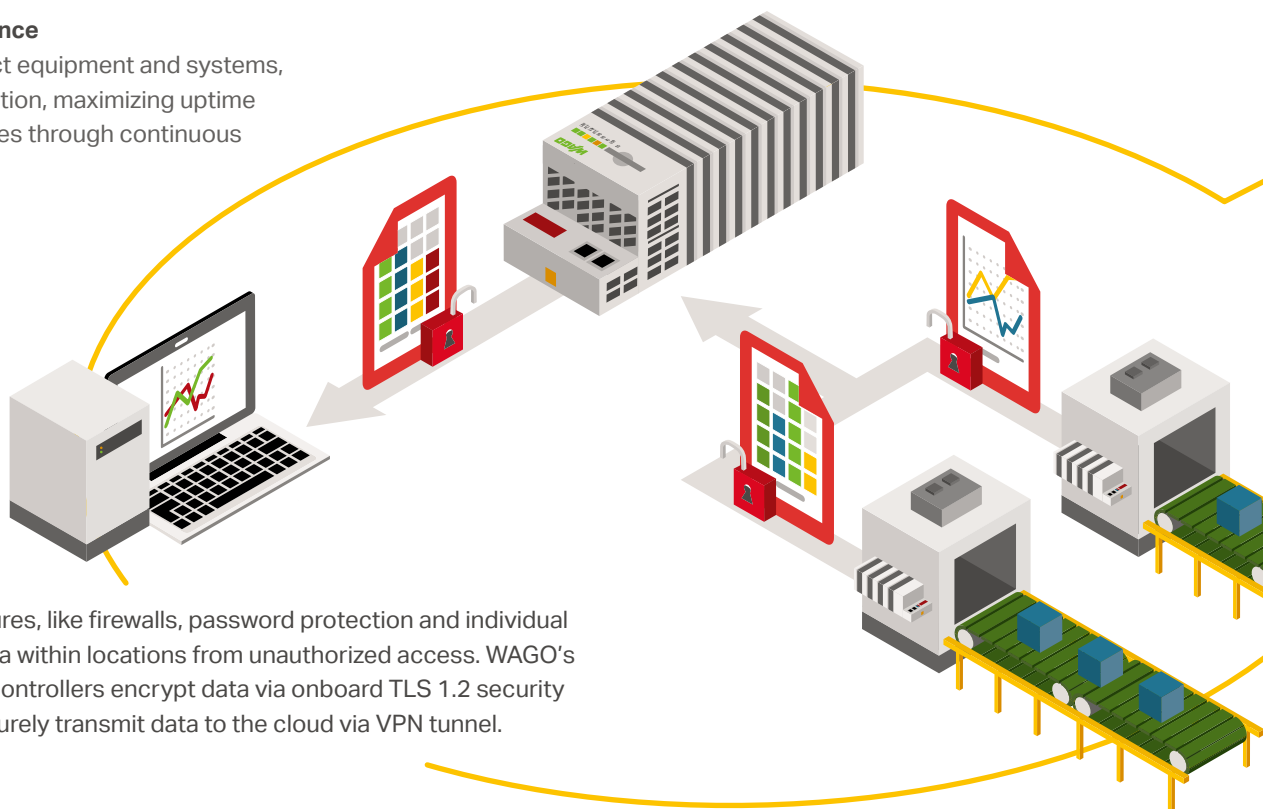
## Benefit from the Internet's central infrastructure

Cloud solutions are also becoming more and more popular for industry. They link the real and digital worlds and simplify the networking of global communications structures across a corporation's multiple facilities.



### Service and maintenance

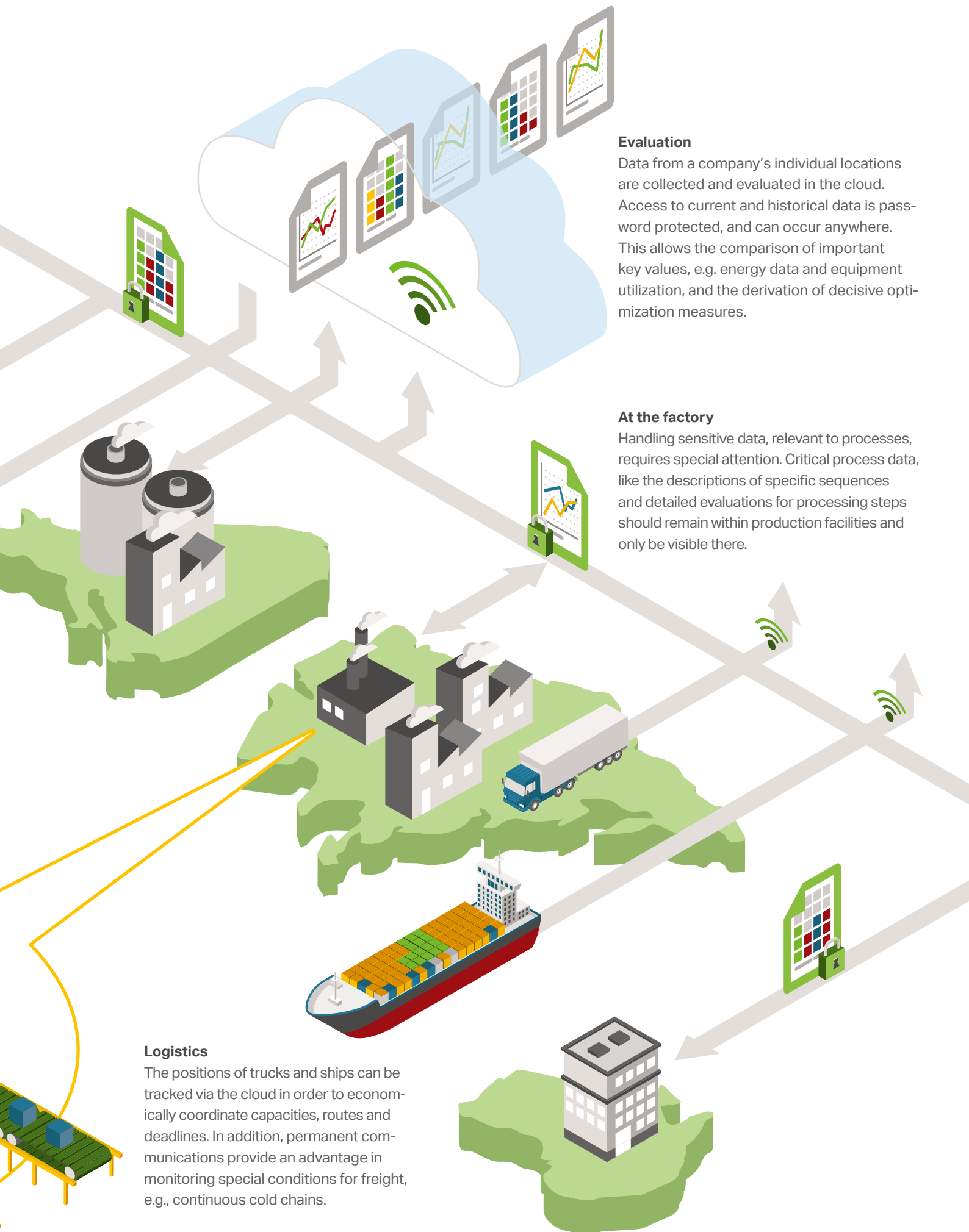
Technicians can inspect equipment and systems, regardless of their location, maximizing uptime and minimizing idle times through continuous monitoring.



### IT Security

Classic security measures, like firewalls, password protection and individual user rights, protect data within locations from unauthorized access. WAGO's PFC100 and PFC200 Controllers encrypt data via onboard TLS 1.2 security protocols and also securely transmit data to the cloud via VPN tunnel.





**Evaluation**

Data from a company's individual locations are collected and evaluated in the cloud. Access to current and historical data is password protected, and can occur anywhere. This allows the comparison of important key values, e.g. energy data and equipment utilization, and the derivation of decisive optimization measures.

**At the factory**

Handling sensitive data, relevant to processes, requires special attention. Critical process data, like the descriptions of specific sequences and detailed evaluations for processing steps should remain within production facilities and only be visible there.

**Logistics**

The positions of trucks and ships can be tracked via the cloud in order to economically coordinate capacities, routes and deadlines. In addition, permanent communications provide an advantage in monitoring special conditions for freight, e.g., continuous cold chains.

Cloud Asset Management by M&M Software

# WHEN REAL AND DIGITAL WORLDS COLLIDE

With the development of the Asset Management Cloud, M&M has created a foundation for industrial applications, like energy management and predictive maintenance. The company, part of the WAGO Group, offers a comprehensive solution package for cloud connectivity – both in production and buildings.

The hype around Industry 4.0 has subsided and settled into a long-term trend. Now, we need to specifically implement Industry 4.0 technology to generate added value for our own companies. Cloud and big data solutions represent the foundation for this to succeed. After all, big data offers potential for linking data available in production and for detecting anomalies. This is the only way to prevent potential disruptions and shorten downtimes. Cloud solutions are a first step along this path. They are both flexible and scalable, as well as provide a high degree of availability and the potential for centralized access. Thus they are becoming the tool of choice for industrial applications. With the development of the Asset Management Cloud,

M&M facilitates data evaluation in the cloud, which provides a foundation for diverse, user-specific solutions, including energy management and predictive maintenance.

## Comprehensive Approach

M&M includes experts in software solutions within the industrial and technical fields. The company is located in Germany's Black Forest, with services spanning management and technology advising, software design and development, and quality assurance. M&M's membership in the WAGO Group means they already have an "in-house" partner for comprehensive solutions,

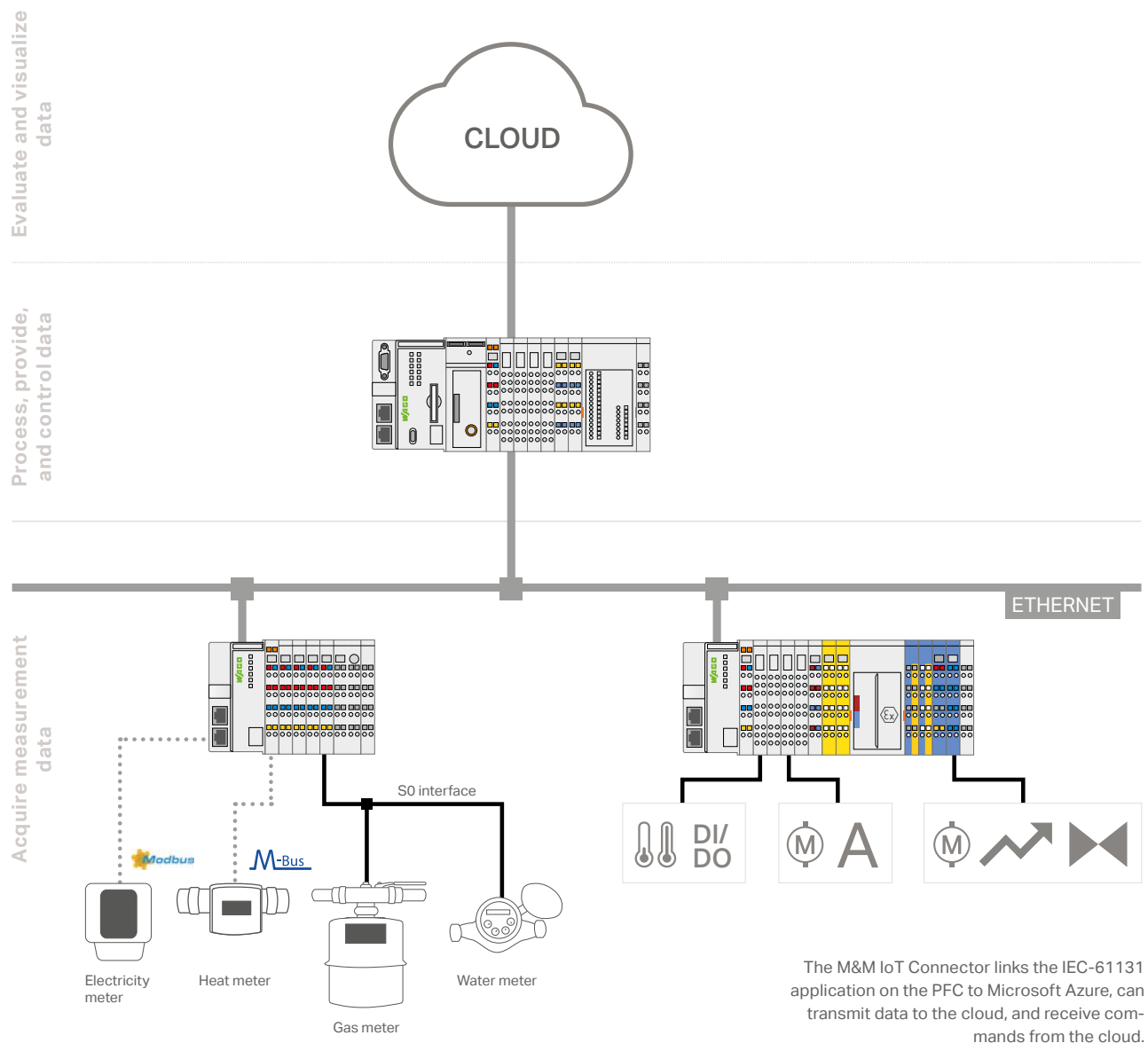


The PFC200 with MQTT interface connects the world of automation to the IIoT.

including hardware. “For us, it is essentially about providing a platform which represents a link between elements of the real and the digital worlds. This includes, on the one hand, decentralized data acquisition and automation, and on the other side, enabling new data-driven business models in industry,” explains Frank Schmid, Head of Business Unit System Solutions at M&M. Decentralized data acquisition and the availability of these data, from the field level up to the cloud, as well as cross-location access to current and historical data, all play decisive roles. They form the basis for application-specific solutions for visualization and monitoring, as well as business intelligence applications.

## Impressive Hardware

M&M establishes the connection to the field level using the WAGO-I/O-SYSTEM 750, including PFC controllers that transmit data to the cloud. In addition, they use an IoT Connector, a software package developed by M&M, which is executed on the PFC. It connects the IEC-61131 application on the PFC to Microsoft Azure, can transmit data to the cloud, and receive commands from the cloud. Communication between the IoT Connector and the cloud is encrypted and performed via the MQTT protocol. The IoT Connector thus offers the potential for retrofitting connections between the PFC family of controllers and Microsoft’s Azure IoT



Suite. You can easily and quickly implement your own small IoT applications using the IoT Connector starter kit for the WAGO PFC. "Users don't have to be experts in software development. With support from M&M, IEC-61131 programming knowledge is sufficient," explains Schmid. The WAGO controllers, both the PFC100 and PFC200, thus form the platform that represents the link between the elements of the real and digital worlds. They also offer a variety of interfaces, forming the perfect foundation for an IoT gateway. They can acquire every field signal, communicate in all industrial protocols, and even enable cloud connection to sensors and actuators that themselves have no Internet interfaces.

## Reliable Partners

M&M collaborates closely with Microsoft in the cloud and Internet of Things, and implements corresponding solutions, preferably using Azure. "Microsoft Azure is highly scalable in relation to computing power, data storage, transactions, availability, and security standards. It offers a quickly growing number of services and tools, making it an optimal foundation for implementing solutions tailored to our customers," Schmid explains in listing the reasons for their selection. Another positive point for the Microsoft solution lies in the fact that the computing centers in Germany are operated



# *»The Asset Management Could manages and monitors the WAGO controllers and their applications and data.«*

by the Telekom subsidiary, T-System. As a data trustee, T-System controls access to customer data.

## **Individual and Flexible**

The Asset Management Could manages and monitors the WAGO controllers, as well as their applications and data. A Web portal functions as a user interface to the Asset Management Cloud services. Customers have access to functions – like project, controller, and user management, controller status monitoring, alarm functions, and email messaging – through the gateway. A dashboard displays texts, tables, diagrams, display elements, and command buttons for comfortable and transparent operation. In user-specific solutions, REST or OPC-UA interfaces are used, for example, in energy and/or condition monitoring.

The advantages of tailored asset management solutions from M&M are obvious: decentralized data can be easily acquired and provided for centralized use. They can also be stored and analyzed locally. In addition, the customer defines which data are transmitted to the cloud. This means that sensitive data do not leave the company. Another advantage: Customers do not need their own IT

infrastructure or software for the solutions, which means they no longer need to worry about operations and maintenance, leading to reduced initial costs. WAGO and M&M jointly provide a complete solution, including hardware, software and additional services. The IoT Connector on the WAGO PFC is additionally configured to flexibly establish cloud connections. The application enables configuration using diverse protocols. Other connections can also be implemented, for example, to the Amazon Cloud, instead of Azure.

**TEXT** NILS WIGGER | WAGO

**PHOTO** WAGO



Using a simple MQTT software upgrade, any member of WAGO's PFC controller family can be transformed into an IoT controller with cloud connectivity – merging IT and automation.

Record, digitalize and link data profitably – this is the core concept behind Industry 4.0. A simple upgrade transforms the WAGO PFC100 and PFC200 Controllers into IoT controllers that transmit data from the field level to the cloud, where the data can be aggregated and used for analysis. This creates true added value for companies – be it for increasing the efficiency of in-house production, implementing energy management in buildings, or further developing end customer services. Existing systems also be made IoT-ready, making them sustainable into the future. The WAGO PFC family of controllers thus are the basis for a sustainable corporate world.

## Profiting from Flexibility

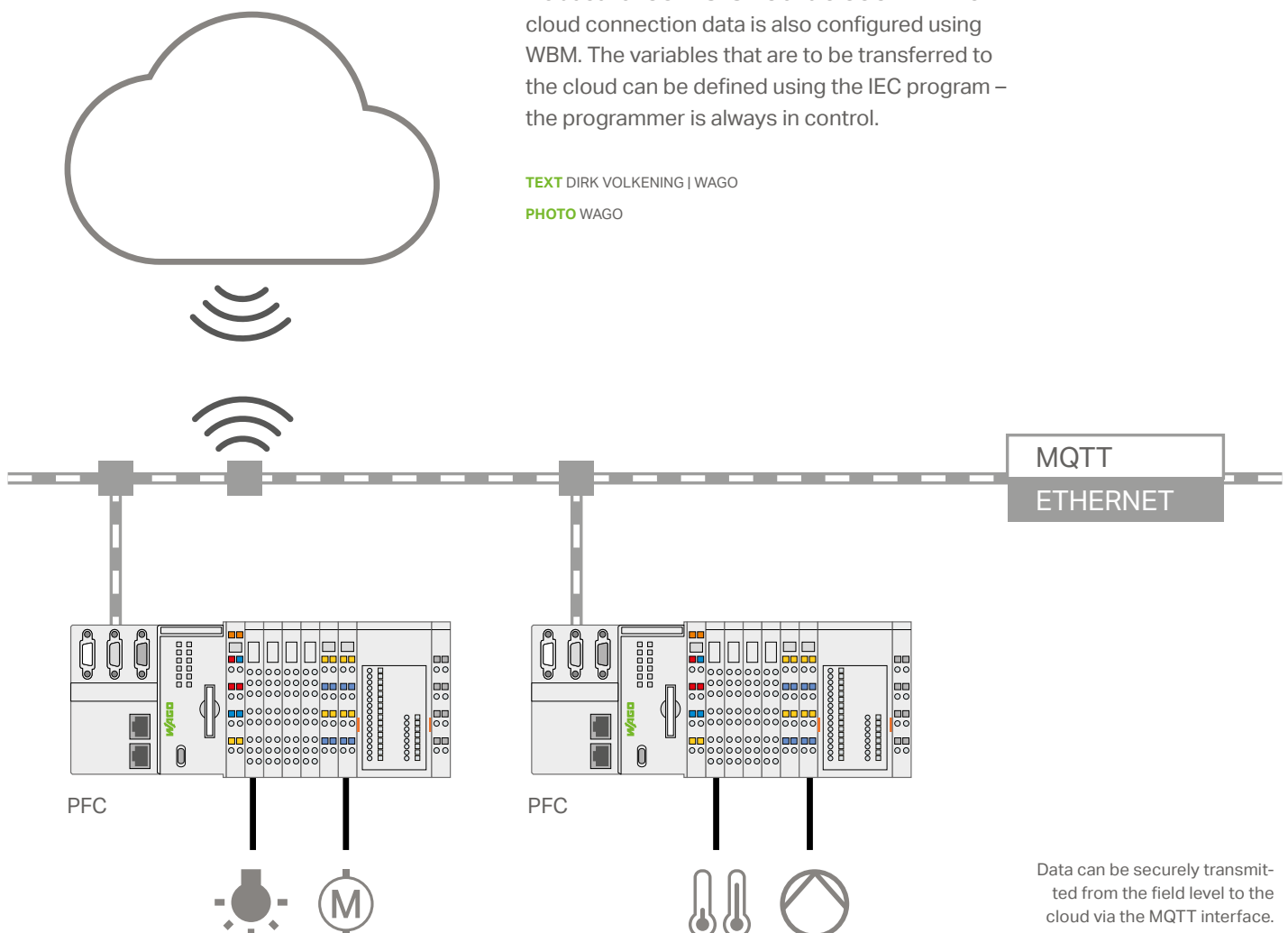
In just a few simple steps, both WAGO PFC100 and PFC200 Controllers can be transformed into IoT devices by installing a firmware upgrade and programming an IEC application with the corresponding library. Following this step, status information such as Run/Stop, connection status, device information and variables defined in the IEC program can be transmitted to a cloud and visualized. The customer can decide whether the controller sends the data to Microsoft Azure, Amazon Web Services, or IBM Bluemix. Connections to third-party solutions will also be feasible in the future due to the standardized MQTT protocol. The data are transmitted in JSON files (JavaScript Object Notation), and the link is encrypted using TLS.

## Upgrades Made Easy

The user can easily run the software update in a Web browser using WAGO's Web-Based Management (WBM) system. In addition, libraries are included for CODESYS 2.3 and *e!COCKPIT*. The cloud connection data is also configured using WBM. The variables that are to be transferred to the cloud can be defined using the IEC program – the programmer is always in control.

TEXT DIRK VOLKENING | WAGO

PHOTO WAGO



Data can be securely transmitted from the field level to the cloud via the MQTT interface.

# »5G Enables New Perspectives and Applications«

With 5G, wireless technology prepares to change the world – in production, mobility and medicine. What the steam engine was for the industrialization, 5G will be for the fourth industrial revolution, and potentially more – Prof. Dr. Leonhard Urbas, professor in process control technology at the Institute for Automation Technology at the TU Dresden, in a conversation with **WAGODIRECT**.

**The global mobile wireless network currently handles some five billion users around the clock, including tablets, smartphones and connected cars. The exponential growth of intelligent devices in society and industry would be inconceivable without networking and mobile data. Huawei, a Chinese network equipment supplier, assumes that between 50 and 100 billion devices could be connected to networks prior to the rollout of 5G technology in 2020. Mobile communications in the future will be fast, and practically delay-free with a latency of less than 1 millisecond. It will offer gigantic data capacity and transmission bandwidth, in addition to real-time communication.**

**Prof. Urbas, is 5G really the miraculous all-in-one solution that it currently appears to be?**

» The big challenge for 5G will be gathering all of the sometimes contradictory demands under one roof, including: Many subscribers, high bandwidth, low latency, fast reconfiguration, high levels of availability, high security and energy efficiency. There are already solutions for each one of these demands. It will be quite exciting, when they are all brought together. In my opinion, this will only be achieved by a comprehensive approach. Correspondingly, Frank Fitzek and Gerhard Fettweis have assembled an interdisciplinary team in the 5G Lab Germany at the TU Dresden which includes 22 full professors and around 600 researchers. «





Prof. Dr. Leonhard Urbas studied information technology in mechanical engineering at the TU Berlin and wrote his dissertation about "Operator Training in the Internet" at the Institute for Process and Plant Engineering. After many years working in the processing industry, he wrote his doctoral thesis on "Human-Technical-Interaction" as Speaker for the Center of Human-Machine-Systems and Head of the MoDyS research group. He has held a professorial chair in process control technology at the Institute for Automation Technology at the TU Dresden since 2006.

In 2015, he became the head of the Working Group in System Process Technology in order to anchor his vision of a computer-supported, highly integrated, process and automation technological design of modular systems with distributed intelligence into his teaching. Prof. Urbas research has focused on methods and effects of digital transformation processes in the process industry, including the use of modular technologies and innovative approaches for configuring human-technology cooperation in cyber-physical production systems.

### What possibilities does a new wireless technology like 5G create?

- » 5G enables new perspectives and applications, for example, in medicine, education, agriculture, entertainment, traffic and production. In production, 5G has the potential to offer real-time-capable, secure and reliable communication infrastructures, which we require for the highly efficient plug-and-produce concepts in the area of convertible factories. The demands for flexibility will only increase. «

### What is the current technological state?

- » Essential components for 5G are already available; the first usable systems have been announced for 2020 to 2022. Difficult problems are being solved in labs around the world in order to enable an intelligent migration path from LTE to 5G using new technologies and architectures. From an application view, the development of wireless technologies is not sufficient in and of itself – at the required latency of 1 ms, the speed of light is already too slow. Therefore, we have to relocate the data and calculations closer to the location where they will be used in Industry 4.0. For mobile applications, the cloud will travel with them. «

### Who is the global leader in 5G?

- » Companies and universities around the world are researching 5G technologies. The technological leadership in 5G is often both political and highly prestigious. It is undisputed that 5G requires a close and early coordination with industrial application partners based on the envisioned real-time applications. The comprehensive approach of the 5G Lab Germany, which has attracted around 50 industrial partners, has risen above many in the crowd, and can serve as an excellent basis for international research collaboration.

Telekom, together with the technical firm, Huawei, has achieved a connection speed of up to 70 gigabytes per second in one transfer attempt, which corresponds to the content of about 15 conventional DVDs. 5G is supposed to be ready for market in 2020, and provide an average speed of 10 GBit/s. For individual applications, however, speeds of up to 20 GBit/s should also be possible. With 5G technology, up to 100 billion wireless mobile devices can be simultaneously addressed around the world. «

### Do you consider this schedule to be realistic?

- » On the one hand, I expect a smooth transition from LTE to 5G. How fast this will actually proceed, I cannot and will not judge. I find the concentrated, global efforts and the occasionally strong support by politicians to be noteworthy. In automation technology, we are, due to our own mistakes during the introduction of digital fieldbuses, correctly restrained about predictions and wagers on the future. With 5G, we have a completely different game – at this point, technology for the mass market has penetrated into areas where we had previously developed specialized solutions geared toward performance. This develops its own dynamic, as we have already seen in domain distributions. «

### In your opinion, what sectors will this technology populate first?

- » 5G is a general purpose technology for real-time communication, similar to the internal combustion engine for transporting goods and people. M2M communication in production, autonomous driving in logistics and agriculture, robotic healthcare, virtual and augmented reality with haptic feedback for entertainment and education are all areas in which a real-time-capable information and communication infrastructure would open new applications and perspectives. The showcases at trade shows are often inspired by industrial uses; however, killer apps will initially arise from the entertainment sector. «

### What potential does 5G have for industry as a catalyst for IIoT?

- » For our applications, 5G is interesting because it connects real-time-capable and secure communication to practically any distributed computing power with mobile data repositories. 5G does not merely mean the development of wireless technology, but the refinement of methods toward targeted and secure distribution of data and computing power at the location where the information processing is optimally performed, under consideration of all boundary conditions, like latency, energy consumption, reliability and information security. In this, I see a disruptive potential in automation. «

**What role will 5G play for production companies in the future – specifically in smart factories – that relates to the networking of all processes in a corporation?**

» In our big data projects, we have seen that it remains incomprehensibly difficult to establish a high-quality database. When considered from the perspective of unforeseeable problems that currently require solutions, the necessity of proactively shoveling data into a central data warehouse leads to a humbling amount of data. In this case, a 5G infrastructure, which enables flexible, real-time connection of distributed data sources to high bandwidths, can significantly increase reaction capability. However, in order to function in a highly flexible system, these data sources must provide significantly more context to the actual useful signal. 5G is thus only a foundational component: Additional elements are real-time-capable and energy-efficient stacks for semantic data, like those developed for the “fast semantics” project based on OPC-UA, as well as suitable methods and tools for designing and implementing distributed analysis and control algorithms. In production, this will involve a transition period of 5 to 20 years. The innovation cycle of the affected industry, configuration of the transition points between conventional, rigid automation and highly flexible 5G-based applications will also play a significant role. «

**Who has experience driving 5G in this sector?**

» Legal requirements, business considerations, economies of scale – 5G has to be economical at the end of the day. The unusual point for automation is that pressure is coming from the mass markets, generating highly varied demands for convergence of different, often incompatible approaches to solutions in a single technological platform. «

**How important is the 5G-PPP standardization initiated by the EU commission?**

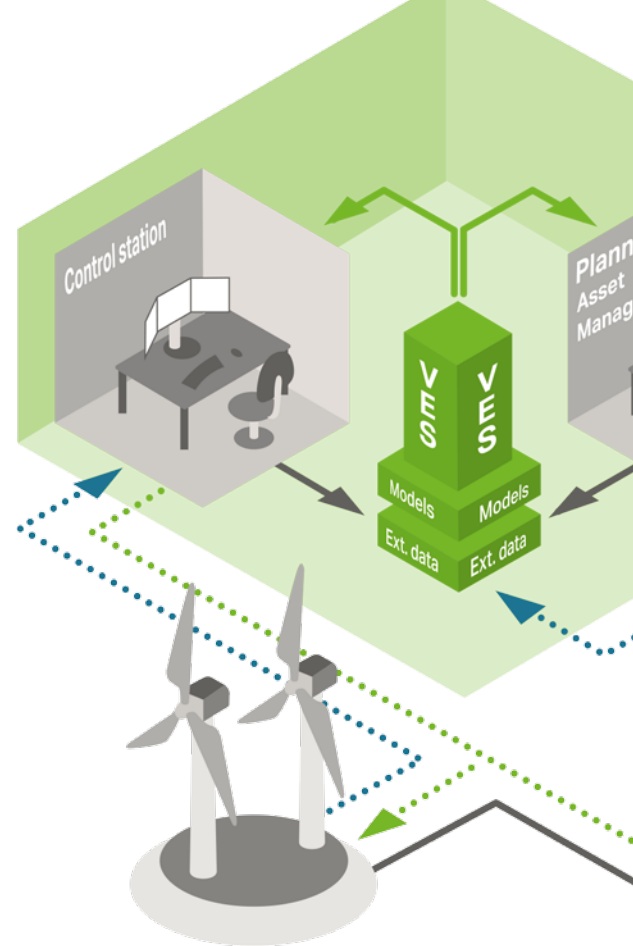
» 5G-PPP is an important platform that enables and promotes close cooperation between manufacturers, researchers and users. 5G-PPP has bundled the European contribution into a global development. Cooperation agreements exist with Brazil, China, Japan and South Korea with the goal of

setting international standards and enabling early market accesses. Publication of the first standards has been announced for 2018, another wave should follow in 2020. The final determinations about radio frequencies are expected in 2019. «

**What is lacking that could assist 5G to completely break through.**

» Like every general purpose technology, 5G has to overcome diverse technical and organizational thresholds. The technical and economic challenges are not solved by any means, and the various solutions diverge markedly. It remains exciting to watch. «

**Prof. Urbas, thank you for the conversation.**



The distribution network becomes transparent.

# ANALYSIS INSTEAD OF EXPANSION

The “Venios Energy Solution” (VES), cloud-based software, provides data for network monitoring and control, while helping prevent bottlenecks.

Volatile amounts of current, network bottlenecks, fluctuating voltage quality – the energy transition has produced a number of challenges. “One of the greatest challenges is providing transparency at the level of the medium- and low-voltage networks. The suppliers here might as well be blind,” states Jonas Danzeisen, CEO and co-founder of Venios.

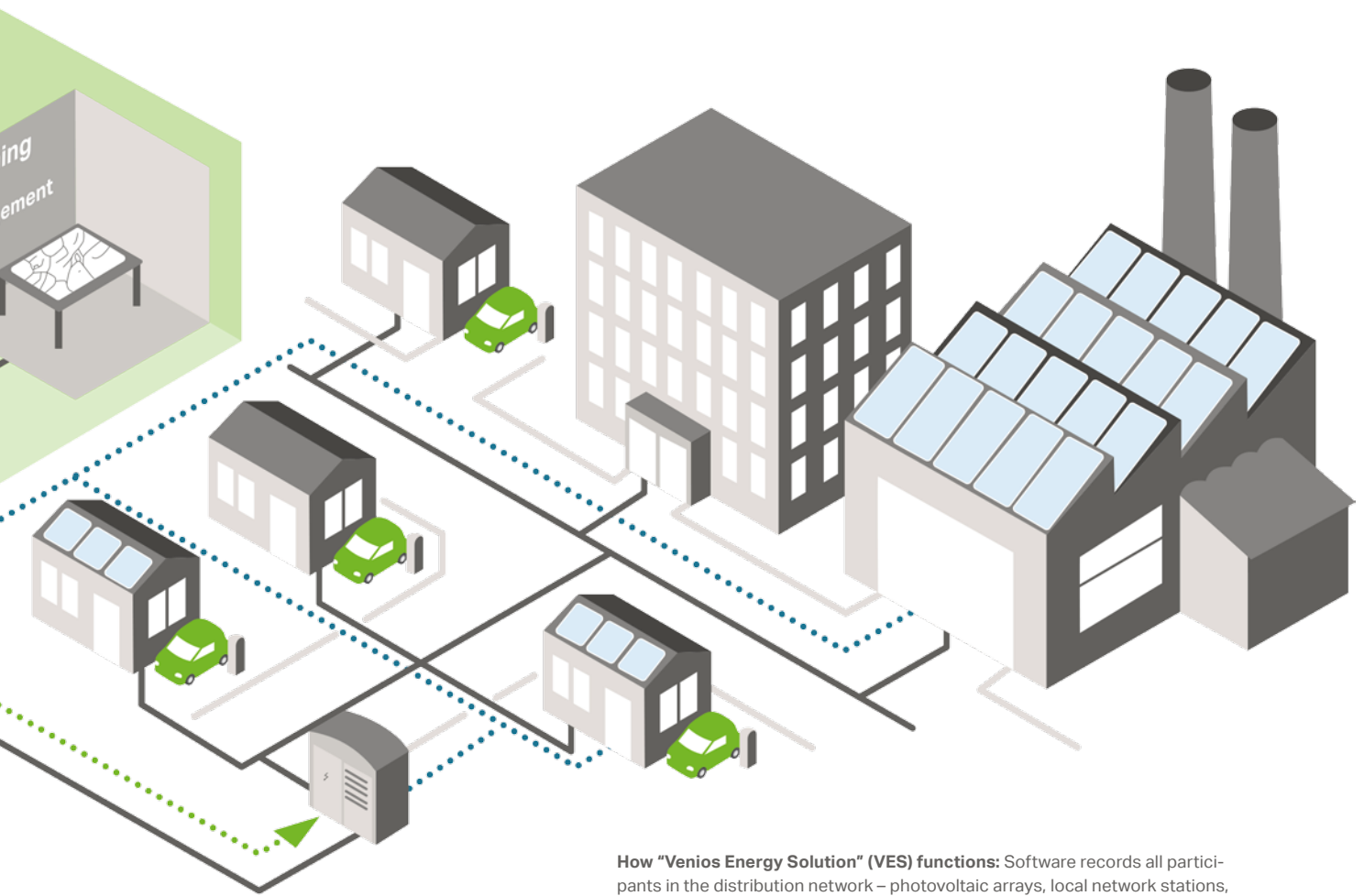
The company has received attention, starting in 2012, for its software; their developers are driven by a vision of tomorrow’s energy distribution. There are already numerous decentralized elec-

trical producers whose output fluctuates with the weather; therefore, new ways to manage the distribution networks are needed. “One path would be to lay new and more powerful cables that can handle any demand. However, it is more economical and sustainable to create transparency in the network. Our software provides this first step, and also assists in the second, which is optimizing the network states,” explains Danzeisen.

## A Hybrid Approach using Models and Real-Time Data

The software is called “Venios Energy Solution” or VES. It records all assets, from electrical conductors through local network stations to transformer stations, that make up a distribution network. Here





**How "Venios Energy Solution" (VES) functions:** Software records all participants in the distribution network – photovoltaic arrays, local network stations, electrical lines and transformer stations – and represents the network state using a combination of calculated models and real-time data. In addition, VES calculates the projected amount of energy generated based on the output of the systems and weather data, and generates forecasts about future network states.

is the trick: In order to provide the desired transparency, the tool uses a hybrid approach made from calculated models and real-time data, insofar as the later are available from the network. The software can map every interim step, from the purely model-based to those redundantly described with measured values. With every piece of new measurement technology, the supplier gains a deeper insight into the state of the network and components. Changes, for example a new decentralized electrical producer like a solar array, can be flexibly incorporated. As soon as they are virtually connected to the network, the software algorithms consider the data (e.g., the output of each facility), calculate the projected amount of electricity generated based on weather data, and produce forecasts of future network states.

"No one expects that German suppliers will equip all of the 800,000 local network stations and other network components with intelligent measurement and telecontrol technology," states Danzeisen. The more interesting question is where intelligent technology is required to optimally use the assets, and where a supplier can rely on models. "If, for example, a transformer runs at 150% for a short time, that is not a problem. However, this should not happen for longer periods. Yet, most suppliers cannot determine when high loads occur and how long they last. This type of information is enormously important for optimized management of the network," according to Danzeisen. Potential is also found in the optimization of maintenance.



What is to be done with the endless data that arise in digitalized energy systems? The cloud provides the requisite computational ability. Modern software helps to transmit information securely from the field level and to manage it.

## High Innovation Speed

Some German providers are already using the Venios software. Loads can be made visible, and then distributed, in order to reduce costs for network expansion. There is also demand for this software abroad. Stedin, a network operator in the Netherlands, relies on the tool as the central component in their current project to determine how to flexibly counteract network bottlenecks. The Venios experts recently conceived of an additional module for a project to link electric vehicles and battery units as electrical buffers to solve this problem; any remaining electrical capacity can be sold. "In this way, an entire series of innovations can be generated, and ultimately the Venios customers will profit. The speed at which we are continuing to develop the software is incredibly high," says Danzeisen.

The software is functionally and technologically up to date. It is cloud-based, and can be operated using the Web browser that is the physical basis for Microsoft's cloud-based platform, Azure.

Azure is now hosted on Telekom servers in Magdeburg and Frankfurt. Microsoft reacted to the requirements of German companies, who did not want their data arriving at third parties via foreign servers. The Venios software is highly scalable, as it is a cloud-based solution.

## The Next Evolutionary Steps are Already Integrated

In the future, suppliers in Germany will acquire increasing amounts of measurement data due to smart meters; this is true on the consumer side as well. Even though there will always be sectors in which excavators are required, "it is more economical to rely on measurement, monitoring and control technology, in connection with software, in many sectors."

TEXT DANIEL WIESE | WAGO

GRAFICS VENIOS, WAGO

# A CUTTING-EDGE SOLUTION

## WAGO Adds a Cutting Unit to its **smart**PRINTER

The WAGO **smart**PRINTER has already set new standards for ease of use, versatility and price – a practical cutter module has now been added.

In actual use, the marking of components must, above all, be reasonably priced, easy, and fast. WAGO delivers all of these features with one integrated and fine-tuned marking system, which includes planning and marking software, the **smart**PRINTER, and various marking materials.

The cutter module developed specially for the **smart**PRINTER completes this solution package, and is available now. This module can be integrated into an existing unit in only a few simple steps. The cutter module's long-lasting, high-quality Japanese blade guarantees precise and neatly cut edges – annoying touch-up cutting by hand and jagged edges are now a thing of the past. The cutter reliably and cleanly cuts the marked materials at the right position.

### One Size Cuts All

As a practical cutting unit, the cutter module is the ideal addition to the **smart**PRINTER, which continues to provide impressive marking results. Marking created using the **smart**PRINTER is clear and resistant to environmental influences, as well as wipe- and scratch-proof according to DIN EN 60068. Additionally, marking can be changed out in just a few steps. WAGO has deliberately kept the marking of its terminal blocks and I/O modules simple. The multiple-line marking strip can also be applied to mixed conductor cross-sections, thanks to the identical contours of the TOPJOB® S Rail-Mount Terminal Blocks. By using the corresponding adapters, it can also be employed for marking all I/O modules. Labels, nameplates, push-button markers, as well as cable and conductor markers can also be processed in addition to marking strips. This makes it possible to mark all rail-mount terminal blocks, I/O modules, pluggable connectors, and relay modules, as well as the conductors and cables connected to them, using one device – and speaking of devices, these can also be marked.

### The Smart Choice

Practical systems, such as the **smart**PRINTER with cutter, help increase acceptance of marking from leading companies due to their fast and efficient marking operation. This system is well-suited for common industrial applications, as well as for use in smaller workshops. Small businesses in particular want to keep marking as simple as possible, due to costs, without the need for maintaining several stationary devices. It is important in this case to keep the number of variants for printers and printing materials as low as possible – without sacrificing any functions or features. The **smart**PRINTER, together with the newly developed cutter module, is the tool of choice, due to its high performance and its low purchase price at a few hundred euros.





The stemys.io Platform is Charting the Industry of the Future

# IN SERVICE TO THE INTELLIGENT FACTORY

Industry 4.0 is an important topic for Tornos SA in Moutier, Switzerland. The machine tool manufacturer now relies on the “stemys.io” software for real-time monitoring and control of networked equipment.

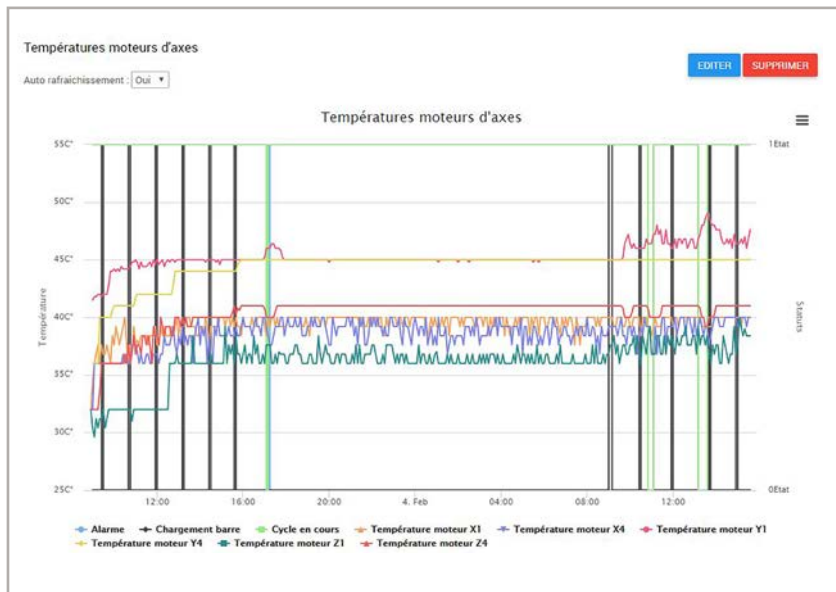


The transformation of the economy through the fourth industrial revolution is in full swing: Production methods, distribution paths, and access to production and services are already changing. The most important advantages of Industry 4.0 lie in flexibility and individualization – not just of products, but even of production processes. The Swiss company, Tornos, builds machine tools for the turning industry. They have dared to take the step from theory to practice, and have introduced a new strategic concept that heralds a far-reaching change. The manufacturer of automated turning machines, founded in 1914 in the heart of the Jura mountains, enjoys global acclaim for the precision and quality of their machine tools. Efficiency and innovations – two important aspects of Industry 4.0 – also define production at Tornos. Therefore, they brought in the Swiss technology firm, stemys Sàrl, to fine tune their automated lathes. “We still don’t have a centralized system; however, the need has become clearly noticeable,” explains Patrick Neuenschwander, the R&D Software & Electric Manager and Research Center Manager at Tornos.

Together with WAGO Contact SA, Sàrl, the start-up from Porrentruy, developed a complete solution for continuous monitoring of the physical values from machines and equipment. Their “stemys.io” platform enables recording of temperature data, vibrations and electrical variables (voltage, output, etc.) in real-time. “When a newly developed automated lathe is put into operation for the first time, there are always a few unpredictabilities. We can simulate the machines with finite elements, but there are always unknowns that we have to determine in the context of practical tests,” according to Neuenschwander. Thus, the desire for a fine adjustment of the factory settings of the machines, particularly those in current development. “Business keeps getting faster; we developed eleven new products in the last ten years,” states Brice Renggli, Marketing and Competitive Intelligence Manager at Tornos. “Therefore, we have to accelerate the release process for our machine tools. With stemys, we are ready for the future.”

They do not leave real-time monitoring to chance: Patrick Neuenschwander (Tornos), Gérard Berset (WAGO), Sébastien Etter (stemys Sàrl), Brice Renggli (Tornos).





With interfaces developed by stemys, all machine data can be displayed and tracked.

Filter par nom	Filter par type	Filter par adres	
NOM	TYPE	ADDRESS	
Alarme	PMC	R6632.1	EDITER SUPPRIMER
Chargement barre	PMC	R2802.2	EDITER SUPPRIMER
Cycle en cours	PMC	R6002.3	EDITER SUPPRIMER
Débit air machine	WAGO_ANALOG	12	EDITER SUPPRIMER
Température ambiante	WAGO_TEMP	0	EDITER SUPPRIMER
Température armoire électrique	WAGO_TEMP	11	EDITER SUPPRIMER
Température bac refroidisseur	WAGO_TEMP	3	EDITER SUPPRIMER
Température bac à huile	WAGO_TEMP	4	EDITER SUPPRIMER

## Optimizing Production

The software developed by stemys not only accelerates machine development, but also opens up new perspectives for preventative maintenance. "Previously, interruptions and other faults were discovered rather late, which often entails delays and high costs," according to Sébastien Etter, Technical Manager at stemys. "With our software, it is possible to make predictions, primarily with respect to wear and fault prevention, and to take proactive countermeasures in order to minimize production losses. In addition, "stemys.io" can also be used to automatically adjust production parameters to the results of control measurements taken in real-time."

In the long term, this test system could be installed in end customers' facilities, as part of quality assurance. Currently the data are collected during benchmarking, prior to delivery of the machine to the customer. At Tornos, the fine tuning of the systems can last from a few weeks (for tool holders) up to several months (in the case of fundamentally new machines). In order to be able to access the data from multiple locations, they are stored in the cloud. The comprehensive raw data are collected and archived in a single file. "We offer several solutions for data security and protection (VPN, SSL, firewalls, etc.)," assures

Stéphane Rey, Product Manager at WAGO. The company also provides open messaging protocols, like MQTT or AMQP, with interfaces for an ERP system (enterprise resource planning), and integrates the whole using fieldbus couplers from the WAGO-I/O-SYSTEM 750. "This system, optimized for process-oriented communication, is distinguished by high processing and integration capacities," opines Gérard Berset, Area Sales Manager at WAGO.

## Integrated Analysis Functions

According to the variables selected, enormous amounts of data can be recorded. The density of these data and their analysis, based on algorithms, forms the foundation for innovations and improvements. "The contributions by customers – when they define their requirements and expectations – establish an important prerequisite for new insights and corresponding measures," explains Sébastien Etter. However, the "stemys.io" platform does not merely offer powerful tools for detection, analysis, storage and visualization of information. Its great advantage is that it can quickly generate new agents in order to integrate objects of all types into the communication. Customers can configure their control panels with the help of widgets, and automate the remote control of networked objects based on rules established

*»With our software, it is possible to make predictions, primarily with respect to wear and fault prevention, and to take proactive countermeasures in order to minimize production losses.«*

by the customers themselves. The intuitive and easy-to-operate software, which includes carefully constructed user interfaces, supports them during this process. "We determined that a good presentation of information is extremely important," states the Technical Manager from stemys; he added a Web designer to his team for this very purpose.

**TEXT** MICHAEL HAUENSTEIN | WAGO

**PHOTO** TORNOS AG

#### About Tornos AG

Tornos, the leading company in their sector, develops, produces and operates high-quality automated lathes and provides individualized solutions for their customers in automotive manufacturing, medicine and dentistry, micromechanics (including the watchmaking industry), and electronics. The company primarily builds CNC automated lathes with moveable headstocks, numeric or cam-controlled multi-spindle machines, and machining centers for particularly challenging workpieces (Almac). To increase their international presence, Tornos has established production locations in China and Taiwan. The company develops and sells products at the mid-level price range, with an excellent price-performance ratio. The corporate group, which employs around 630 people around the world and supports 38 apprenticeship positions, had sales of 164 million Swiss francs in 2015.

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