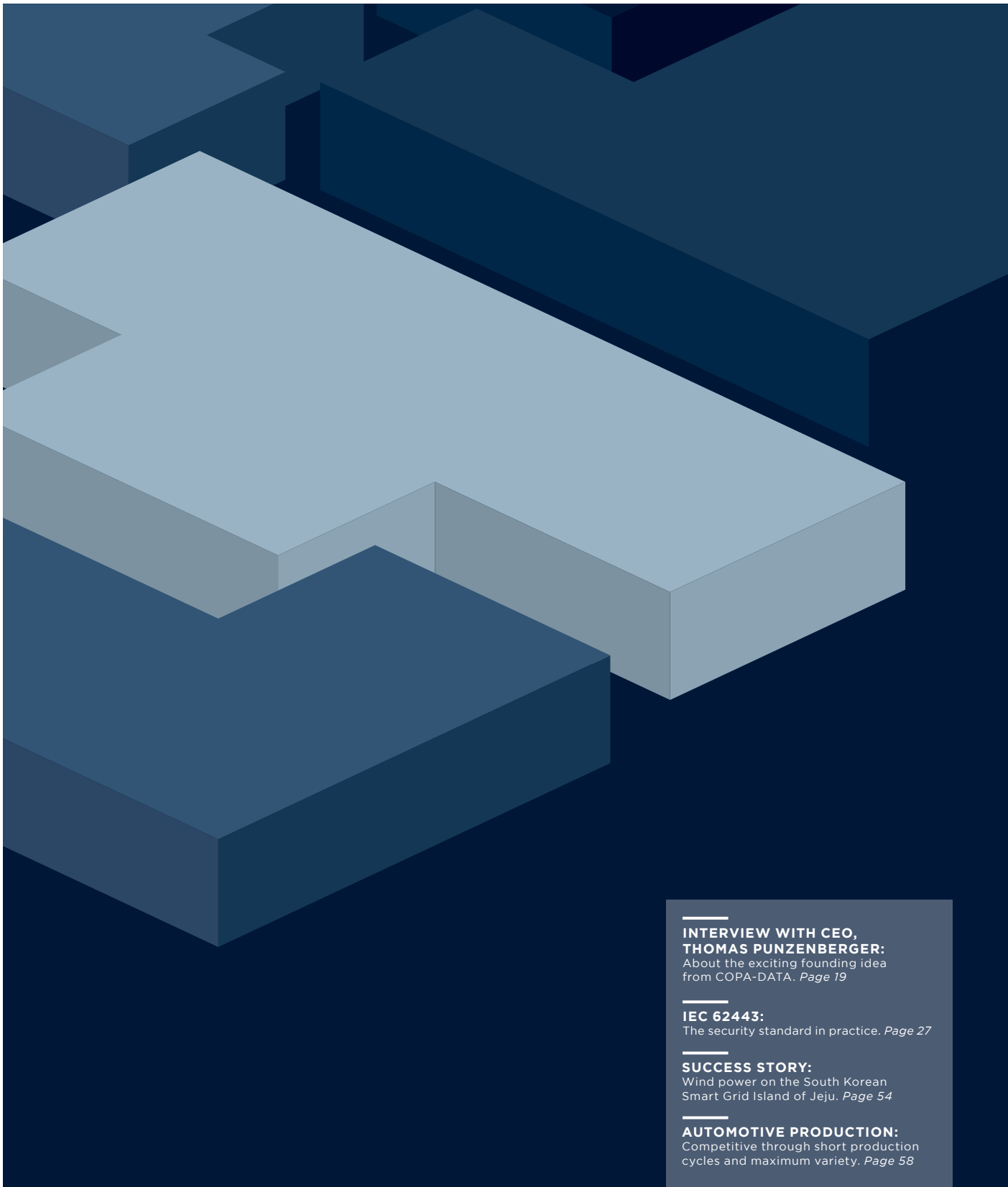
IU

INFORMATION UNLIMITED

Spotlight:
A NEW AGE OF SOFTWARE



THE COPA-DATA MAGAZINE | ISSUE #33 2018

IU
INFORMATION UNLIMITED

THE COPA-DATA MAGAZINE

ISSUE #33 | NOVEMBER 2018

PRESIDENT AND PUBLISHER:
Thomas Punzenberger
Ing. Punzenberger COPA-DATA GmbH
Karolingerstrasse 7b, 5020 Salzburg, Austria
Commercial Register Number: FN56922i
t +43 (0)662 43 10 02-0
f +43 (0)662 43 10 02-33
www.copadata.com

EDITOR-IN-CHIEF: Phillip Werr
PROJECT MANAGEMENT: Christina Andexer
EDITORIAL TEAM: Eva-Maria Oberauer-Dum, Nicola Richter, Esther Rutter
ART DIRECTOR: Manuela Rettenbacher
PHOTOGRAPHY: Florian Mitterer Photography, www.florian-mitterer.at, photos: pages 76, 78, 79, 80.
COPY-EDITING:
Supertext Deutschland GmbH, Berlin

AUTHORS/CONTRIBUTORS: Julia Angerer, Emilian Axinia, Sebastian Bäsken, Christoph Dorigatti, Emanuel Gollob (guest author), Andreas Grün, Dominik Hellinger, Peter Kemptner (guest author), Ursula Kramarczyk, Reinhard Mayr, Emrah Mehmedovic, Garret Miller, Andrea Mitterer, Francisco Ortiz Muñoz, Johannes Petrowisch, Thomas Punzenberger, Jürgen Resch, Stefan Robl, Dieter Strauß (guest author), Lee Sullivan, Phillip Werr, Markus Wintersteller

PRINT OFFICE:
Offset 5020 Druckerei & Verlag Ges.m.b.H., Bayernstrasse 27, 5072 Siezenheim, Austria
LETTERSHOP:
BK Service GmbH – Dialog Marketing Agentur, Neualmerstrasse 37, 5400 Hallein, Austria
PRINT RUN: 12,860 copies

linkedin.com/company/copa-data-headquarters
facebook.com/COPADATAHeadquarters
twitter.com/copadata
xing.com/companies/copa-data
youtube.com/copadatavideos

CONTENTS

CONTACT /
FREE SUBSCRIPTION:

IU@COPADATA.COM
WWW.COPADATA.COM/IU

PREFACE

Dear readers,

In recent years, a lot has been written about current trends and future developments. Following a phase during which many of us have grown weary of the latest buzzwords, we are actually seeing the dawn of a new era. In this issue, we are giving this our full attention – with a special focus on software in general as well as on the latest innovations at COPA-DATA and in zenon.

Security has also moved on from being a trend topic to a constant companion. This issue provides a number of fascinating insights into this topic, including not only zenon and the IEC 62443 standard (*page 27*) but also security in the beverage industry (*page 40)*.

As ever, you will also find articles on a number of interesting customer projects. You can read about how zenon is being used in an energy storage application on the Korean island of Jeju as well as at Italian craft beer brewery Birrificio Antoniano to meet the rising demand for its beers.

Take a look and be inspired!

THOMAS PUNZENBERGER, CEO

SPOTLIGHT

SOFTWARE: AN ANCHOR OF INNOVATION DURING DIGITAL TRANSFORMATION

FROM "HELLO, WORLD" TO DIGITAL TWINS

Software and networks of computers across all performance classes form the basis of digitization – in industry, business administration, and lots of areas of day-to-day life. Without this technology, Smart Cities, Smart Factories, Smart Grids, and many other concepts would remain mere pipe dreams. Yet, like so many history-changing developments, software went more or less unnoticed by the public during the early days of its evolution. Nowadays, we encounter software in the form of apps on any smartphone. Its disruptive impact is now being felt; offering new features for everyday products and services and enabling us to establish new business models.

When Konrad Zuse launched the first freely programmable computer, the Z3, back in 1943, software was still in its very earliest phase of development. An assembler was used for programming. The first high-level languages did not arrive until the 1950s.

Later, when monitors became available as human-machine interfaces (HMI), the code used to output "Hello, World!" began appearing in almost any tutorial for learning a programming language.

As each new generation of computer was developed, it brought with it new, more powerful software. Slowly but surely, software development became a profession and an industry in itself.

In the 1950s and '60s, alongside military purposes, software was developed primarily for commercial applications such as accounting. There was still a long way to go before software could be used on the shop floor for industrial production.

One big step forward in the interaction between software and the real world was the use of computers equipped with interfaces for sensors, actuators, displays, and audio systems. Voice input and output systems and touch screens make it easier for computers to communicate with humans. However, this digitization did not start in industry, but in the consumer sector. Smartphones and tablets have opened the door to brand-new types of applications.

SMART CITIES WITH SMART TRANSPORTATION

Software can also act as a driving force in more traditional industries. Hailing a cab ride was based on the same basic principles for decades. But smartphones and GPS, in connection with a fitting software, create new concepts – an opportunity that transport providers like Uber have really made the most of. Using GPS data for vehicles logged into their systems, these taxi services are able to keep an eye on their fleet's location at all times. Travelers heading to similar destinations are able to share rides and benefit from low fares.

Transport experts are taking the concept of shared mobility one step further: integrating public transport into these services will allow consumers to enjoy "Mobility-as-a-Service." As a result, travelers will no longer have to spend time deciding which modes of transport and which tickets they need to reach their destination. Instead, an app provides an overview of the multiple transport options available to them. Working with the transport providers' software, the app will suggest various routes from which the user can choose. Following selection, the user pays for their fare using the app. A single selection might combine, for example, a trip from a downtown subway station to a suburban one, followed by an onward journey in a taxicab. Buses, hired bikes, and rental vehicles could also be integrated into this kind of mobility solution.

The challenges lie in creating the powerful software that is required and setting up a common database that can be used by all public and private companies involved. Transport for London has made some strides in this area in terms of public transport and true Mobility-as-a-Service is already a reality in Helsinki. [1]

SOFTWARE-DEFINED FEATURES – THE KEY IS IN THE SOFTWARE

One company showcasing exactly what can be achieved when you use software to dynamically improve classic product characteristics is the electric car pioneer Tesla. Software updates for the company's vehicles improve existing functions or even add brand new ones. For example, a software update could improve the steering assist function for higher speeds, or it might even add additional features, such as lane change assist. And yet this isn't all that Tesla software is capable of. If customers opt for a fee-charging upgrade, they can activate hardware that was installed at the factory to access new features long after they purchase their vehicles. This approach allows Tesla to build standardized vehicles, but use software to adjust the vehicles to different user specifications.

NEW BUSINESS MODELS IN MACHINERY AND EQUIPMENT CONSTRUCTION

Software is also disrupting business models in industry. Under consumption-based business models, machinery manufacturers provide their machines as a service in return for a service charge. Charges are calculated according to usage variables, such as the number of units produced or length of usage. Applying this concept, companies like the Swiss machinery manufacturer SIG set up their packaging machines for free on their customers' premises. They then charge their customers based on the number of units packaged. [2]

Thanks to connected machines and corresponding cloud-based software, service-based business models can be implemented on a wide scale. This approach allows the performance of the individual machines to be quantified, compared, and analyzed. "Intelligent" software takes into account the context of the data produced and suggests improvements, such as streamlining a machine pool or carrying out predictive maintenance.

---

[1] *Source: http://smartcity.deloitte.com/case_studies/mobility-as-a-service-helsinki/*
[2] *Source: https://www.brandeins.de/magazine/brand-eins-wirtschaftsmagazin/2014/alternativen/gewusst-wie (Source only available in German)*
[3] *Source: https://www.ipk.fraunhofer.de/en/hm17/digital-twin/*

DIGITAL TWINS IN DEVELOPMENT AND PRODUCTION

The importance of software is not only growing in terms of how machines and equipment are operated; it is also becoming increasingly important throughout their entire lifecycle. In this context, the concept of the digital twin is key. This twin acts as the virtual version of a real-life machine or piece of equipment. Using software, a digital twin reflects the geometry, structure, and response of the equipment. It can even mirror its entire lifecycle – starting with design and production, through to setup and operation, and all the way to decommissioning.

A manufacturing company is therefore able to use a digital twin during the planning stage to check whether an existing piece of equipment can produce a one-off product. [3] This technology can also be used to create virtual product options before they are actually produced.

During operation, a digital twin reflects all process data and equipment states, thereby providing complete transparency across the entire lifecycle.

PRODUCING AND SUPPLYING RENEWABLE ENERGY

The switch to renewable energy presents a challenge to the operators of distribution grids. In the past, power was generated by power plants that could be carefully controlled. Now, this job is increasingly performed by PV plants and wind parks where input depends on the wind and weather. Another complication arises from the variety of locations from which power is now fed into distribution grids. The solution to both of these problems is an intelligent network – a Smart Grid – which connects and controls all of its components.

Smart meters, sensors, and various measuring points within the grid provide the foundation of data needed to enable software to manage the Smart Grid, whether locally or centrally. Software keeps the grid stable and efficient by coordinating the production, distribution, and storage of power.

We have outlined just a few examples of how the importance of software is growing in the age of digitization. In the article below, we will look at how industrial software has changed in recent decades and what jobs this software can now fulfill.

SOFTWARE IN THE AGE OF DIGITAL TRANSFORMATION

Software and networks of computers across all performance classes form the basis of digitization – in industry, business administration, and lots of areas of day-to-day life.

Digital transformation did not start in the field of automation technology, but in the consumer sector. The combination of improved connectivity, mobile devices, and the cloud has opened the door to brand-new types of applications.

Using software on connected systems allows new features to be added to everyday products and services.

Cloud software has enabled Mobility-as-a-Service. When a traveler enters their journey starting point and end destination into their smartphone, the app selects the best forms of transport. The customer can then book and pay for their trip in the app.

“Intelligent” software takes into account the context of the data produced. It can, for example, provide tips on how to improve equipment efficiency and predict when preventative maintenance needs to be carried out.

A digital twin – a software-based replica of a piece of equipment – allows manufacturing companies to check whether their equipment is able to produce a certain product variation.

INDUSTRIAL AUTOMATION, THEN AND NOW:

THE CHANGING WORLD OF SOFTWARE

The manufacturing industry demands the highest level of flexibility so that it can adapt to changing requirements in an agile and dynamic way. Businesses therefore need production resources with automation systems ready to meet these challenges, offering flexibility, reliability, and outstanding ergonomics. At the same time, the IT and OT worlds are converging, and there is a growing demand for openness and scalability. In response, industrial software is becoming more complex and is playing an increasingly significant role in manufacturing processes. To describe the current landscape accurately, we need to look beyond the rigid structures of the traditional automation pyramid.

If there's one thing pyramids are good for, it's longevity. In Central America, southern Europe, northern Africa, and China, some of them have been standing for several thousand years. Of course, the automation pyramid is nowhere near as old, but it has been used for more than 30 years to represent the different levels of control, supervisory, and management within industrial manufacturing plants.

THE PYRAMID: A PRODUCT OF ITS TIME

Representations like this can only reflect that with which people are already familiar. First conceived in the 1980s with the needs of major industrial enterprises in mind, the automation pyramid shares many features with the way in which an enterprise of this kind was typically organized at the time: a strictly hierarchical structure descending from the executive peak of the pyramid to ever-widening levels of operational and process management, down to the control level. Participants at the control level communicate with a broad base of processing entities via the field level.

The pyramid's similarity to military organizational structures cannot be overlooked, nor can its strict separation of control and management levels from the manufacturing and process levels – which in many representations was shown not within, but beneath (and therefore outside of) the pyramid. In most definitions of the concept, the field level is described as an interface with the technical production process, which is a telling fact. In particular, it reveals how mechanical engineers at the time viewed the notion of technology. Evan today, some engineers still view automation (and therefore software) as separate from the mechanical systems in their factories.

AUTOMATION: A CONCEPT BEING TRANSFORMED

When the automation pyramid was first theorized, software was virtually unheard of on factory floors. Even the term "mechatronics" had not yet been coined. Against this backdrop, it is worth delving a little more into the concept of automation because it can mean different things to different people.

Even in the early days, machines provided a solution for many of the steps involved in manufacturing complex products at high volumes with a high level of efficiency and consistently high quality. Before the introduction of programmable logic controllers (PLCs), automation in those days was limited to the automatic execution of constant and

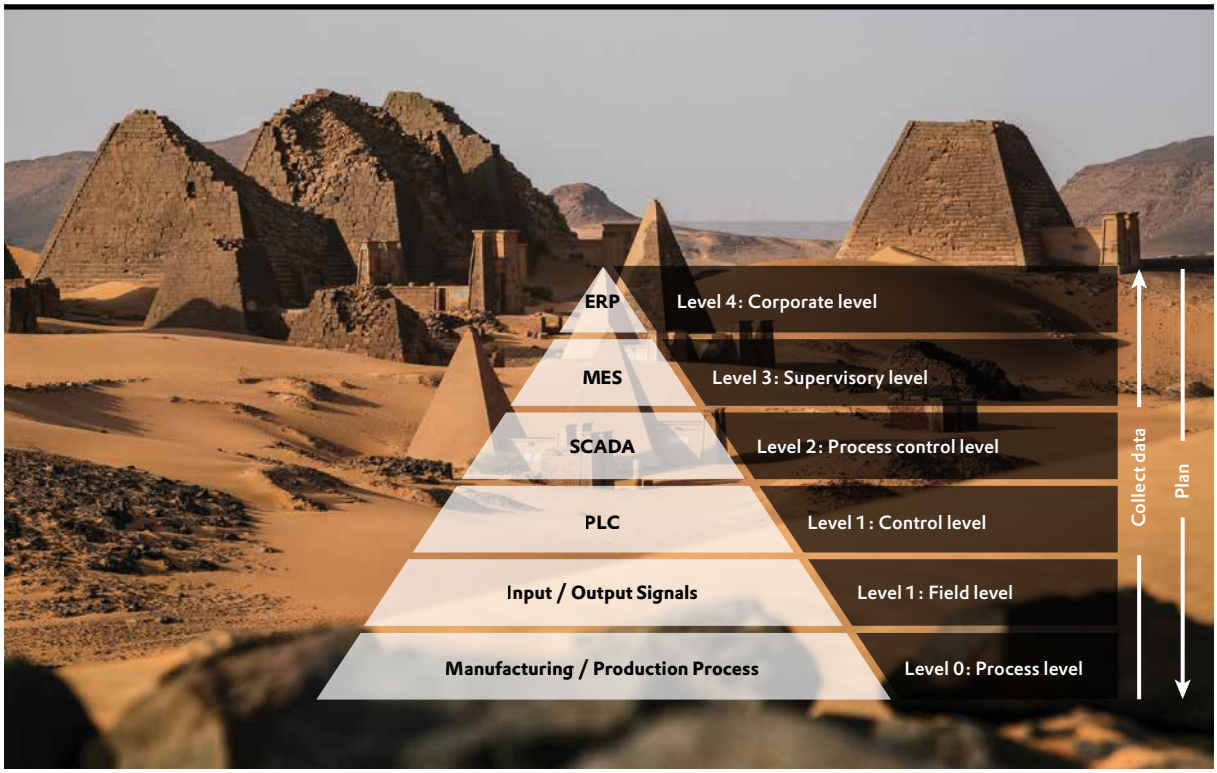


Figure 1: The traditional automation pyramid was first theorized over 30 years ago, when a mechanistic worldview dominated in the field of industrial production and the term "automation" was understood very differently. Like these stone pyramids at Meroë in modern-day Sudan, the automation pyramid served its purpose and has since been superseded by more modern forms of architecture.

predetermined internal processes controlled by hydraulic, pneumatic, or mechanical means (such as cam disks).

At the advent of PLCs, the programs were initially nothing more than lists of instructions on how to set the output signals in sequence to control actuators such as valves, solenoids, or electric motors. Unveiled in 1974, the first PLC from the European market leader was able to process a maximum of 4,096 commands, and strictly sequentially; that is, one after the other. Programmers had to adopt a whole new approach – not just for breaking down complex processes into their natural logic, but also for translating these into sequential programs.

That said, PLC technology offered the possibility of subsequently modifying programs or even loading different programs to suit varying needs. Above all, it made it possible to respond dynamically to input signals from sensors during operation. As a result, it allowed production resources to adapt their behavior automatically to suit changing circumstances.

This capability marked the difference between simple programming and real software development – and between simple mechanization and real automation. This technology paved the way for what we now refer to as Industry 4.0.

SHIFT-BASED COMPUTERIZATION

The performance of industrial controllers was advancing in leaps and bounds, as was the availability of peripheral systems required for the collection, processing, and reporting of process data. The mid-1980s saw the introduction of the first control computers whose architecture was compliant with the new PC standard. This kindled hope for inexpensive components from the mass office market and reduced the cost of installing connections between machines and to other systems.

At the time, computer systems had already gained a foothold in other parts of companies. In administrative areas, they provided systems for stock management, accounting, and payroll accounting, now subsumed under the umbrella term "enterprise resource planning" (ERP). Operational teams and schedulers used manufacturing execution systems (MES) in order to establish detailed production plans based on order data and information relating to the properties and availability of materials, personnel, machines, and tools.

Initially, machines failed to interact well with one another because they had been developed as self-contained systems. Not only were there no open interfaces between them, but in many cases the benefits did not justify the cost associated with the individual programming required. Nevertheless, the complete automation of entire production lines was an alluring prospect. In addition, the first industrial bus systems for data transfer were being developed.

Over 30 years ago now, this progress resulted in the launch of systems for the control and monitoring of

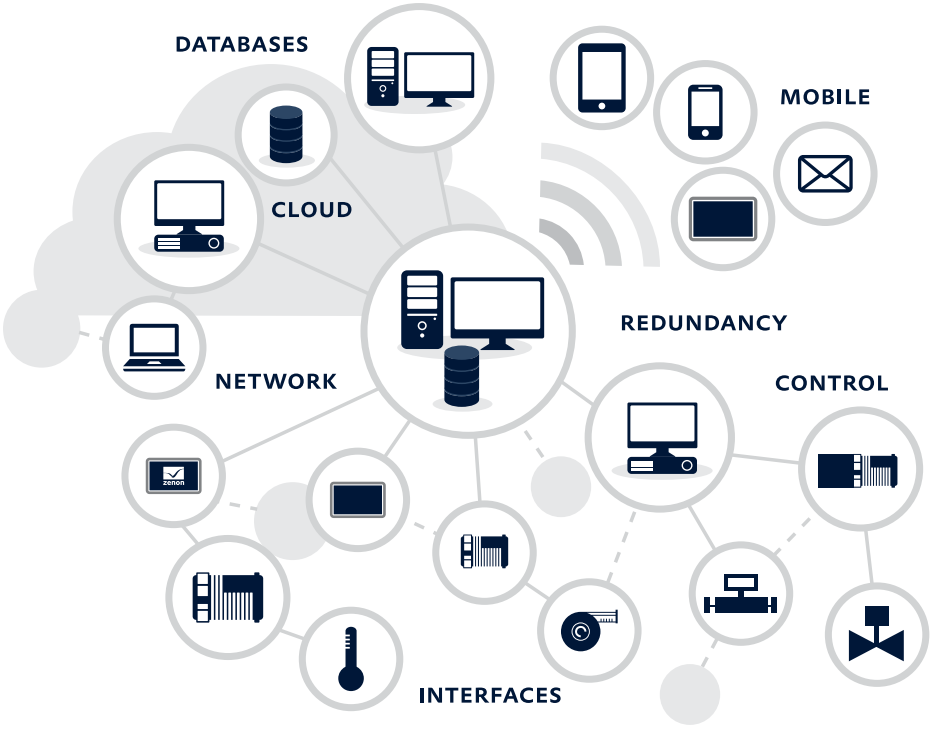


Figure 2: Customized and adaptable architectures are needed in order to create industrial automation software that is ergonomic, open, flexible, and scalable, yet also reliable.

production processes. Referred to as supervisory control and data acquisition (SCADA) systems, they formed the central layer between the control level – with which they interacted in the same way as a conductor interacts with an orchestra – and production planning at the operational control level. With their multi-system communication and integration capabilities, components like zenon made the automation pyramid complete.

CONSUMPTION CREATES AN APPETITE

At the same time, the idea of computer-integrated manufacturing (CIM) was born. In this concept, a single, comprehensive software system would control all the operations taking place in a company, collect the data produced, and prepare this data for use by decision-makers. A system of this kind would cover the entire automation pyramid.

Unfortunately, at the time, the cultures and technical data requirements of administration and production were too different, the complete networking of all production resources was too expensive, and the capacities of systems were too limited. What's more, a comprehensive software solution for all operational purposes would have become an overwhelmingly difficult beast to tame – not to mention the fact that obtaining a system of this kind from a single source sounded too much like dependence.

"With the founding of COPA-DATA came zenon: a system that enabled data exchange between peripheral equipment and everything from the sensors to the ERP system that was not bound by the limitations of strict hierarchies," explained Thomas Punzenberger, founder and CEO of COPA-DATA, on the occasion of the company's 30-year anniversary in 2017. "Without having to solve everything within a single system, we had created a digital tool that people could use to get things done more easily than could ever have been possible through conventional means."

CHANGING CONDITIONS

Today, some 30 years later, storage volume and computing power are virtually unlimited, and the costs associated with them are negligible in the context of mechanical and plant engineering. The computer architectures for distributed installation in the field, including those in operator terminals and drive controllers, in the control station, in server rooms, and in the cloud, are essentially the same as those found in office settings.

Fieldbus systems based on Ethernet allow the rapid transfer of large volumes of data and thus provide a detailed base of information. Structured communication networks also make it possible to exchange data regardless of the physical connections. It now matters little whether data

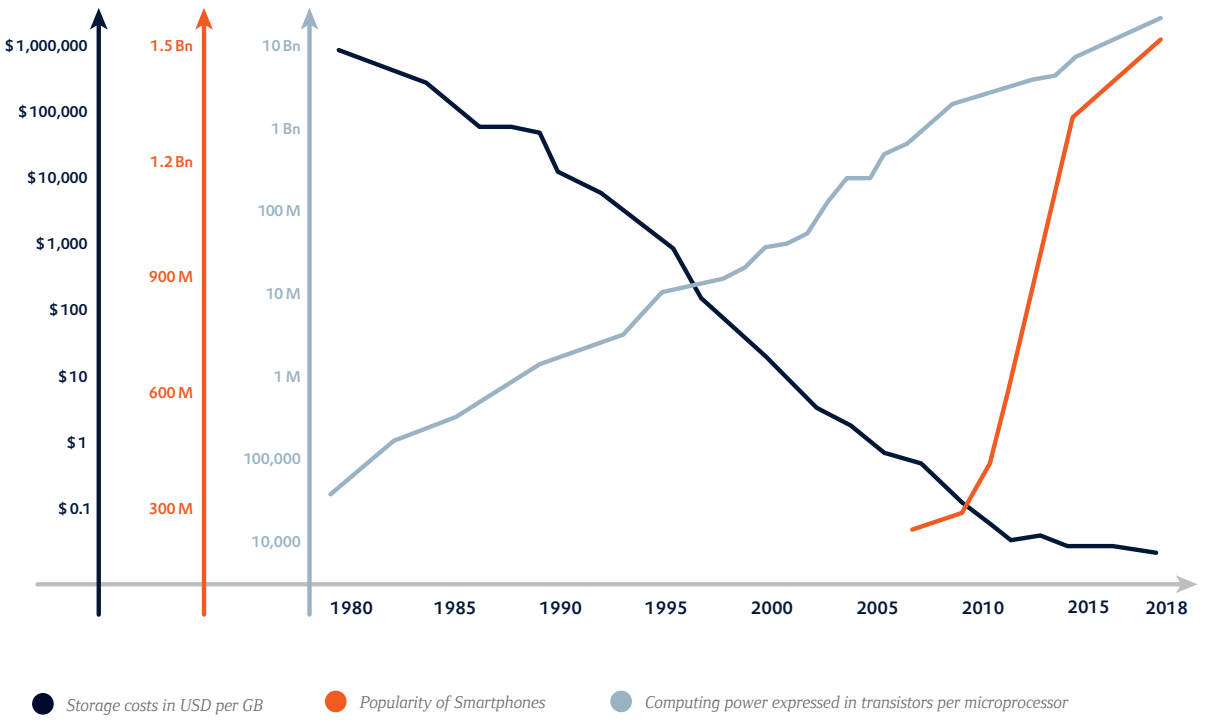


Figure 3: Computing power, storage costs, and smartphone popularity – three of the factors that influence our technology decisions in the long term. *Source:* Gartner, IDC, Apple, mcomo.com, ourworldindata.org

exchange remains limited to the shop floor, incorporates other parts of the business, or uses Internet mechanisms.

Likewise, people from all career paths have long since become accustomed to the support offered by computers and software in every scenario, even if they have no programming knowledge at all. The majority of the 35-and-under age group grew up with this technology in their personal lives, while those under 25 are accustomed to being online at all times through their mobile devices and interacting with the world using easy-to-install apps.

PARADIGM SHIFT

Today, software solutions can often be created at lower cost and developed to their full potential much more easily than in the past, and this has led to a reversal of the mechatronics worldview. Mechanical and plant engineers no longer regard mechanics as the exclusive centerpiece of their projects.

Functionality has now become the key focus of today's established approach to mechatronics. And functionality is something that can be fully represented in software – at least until valid simulation results can be obtained using digital twin technology. This representation also includes sensors, actuators, and mechanical elements, which – like the control software and in parallel with it – are derived from the machine or plant concept.

The reappraisal of some aspects of the production process has led to a break-up of established, isolated categories, meaning that the traditional automation pyramid is no longer considered adequate for describing automation as a whole.

THE COLLAPSE OF THE PYRAMID

In many enterprises, the once-thick walls erected between various departments are becoming more transparent. The product development process is now an overarching objective, covering everything from the product concept and development to the development of production resources and production planning, all the way through to the control of individual machines or system functions. This means that, some time ago, the concept of automation as a whole stopped referring exclusively to how production resources are controlled and began including the automation of engineering tasks too. It encompasses information transfer between individual specialist disciplines as well as effective workflow management.

As well as this, it covers the simulation of product properties and production resources, as well as the actual production process, using computer modeling. Structures

INDUSTRIAL SOFTWARE, THEN AND NOW

Before the introduction of programmable logic controllers (PLCs), automation of production plants was limited to the automatic execution of repeated and predetermined internal processes.

PLC technology gave businesses the ability to respond dynamically to input signals from sensors during operation. As a result, it allowed production resources to adapt their behavior automatically to suit changing circumstances.

Just as Albert Einstein and Stephen Hawking did not quite manage to explain all natural physical phenomena in a unified field theory, the CIM-based idea of end-to-end automation with software from a single source had not yet come to fruition.

Today, computing power and storage volume are virtually unlimited and no longer represent a significant cost factor. Software solutions can often be created at lower cost and developed to their full potential much more easily, prompting a reversal in mechatronics-based thinking.

Today, the complete automation of production plants also includes the automation of engineering tasks. It often covers multiple locations and incorporates energy installations, building services engineering, logistics, and the systems of partner companies.

and methods are not applied to the real world until they have been put through their paces using digital twin technology.

Meeting the challenges of Industry 4.0 requires a production process that can adapt to changing requirements in an agile and dynamic manner. In order to strike the perfect balance between volume production and a high level of customization, production resources and their associated automation software need a modular configuration with increasingly fine granularity to accommodate their growing complexity. Just like the plug-and-play mechanisms found in modern office computer equipment, this ensures largely unrestricted usability and makes it easier to configure production resources dynamically, grouping them to suit the needs of each task.

So that business strategies can be implemented efficiently and adaptively, these resources need to be integrated directly into the company's entire value chain. This requires all parts of the automation system to communicate with other systems in the business on many levels – and this in turn challenges the traditional boundaries that exist within companies.

DEMOCRATIZATION OF SOFTWARE

There are many ways in which it is possible to achieve the increasing level of adaptability that production plants and their automation systems require. Self-learning mechanisms are one example: these respond to changing operating conditions and adapt to the production rate actually achieved instead of adhering to a strict cycle.

Production plants are given structured points for the various groups of people involved in them to intervene, with each customized to suit a particular group. These are found in all areas of the system as well as outside of it, and exist independently of a plant's level of modularity. In such conditions, tasks are likewise structured with fine granularity, from data acquisition to user-specific analysis and representation. The independence of the hardware used for this purpose needs to be ensured through the use of web-based methods; for example, so that alerts can be issued without being reliant on specific locations. These same methods need to be used when integrating software products from different developers to work in tandem to create dashboards and reports.

Increasingly often, a software system's key functions include the recording and administration of all operating processes and the associated data (even directly from sensors) for the purposes of predictive maintenance and verification management. Furthermore, it is not uncommon these days for complete automation solutions governing production systems to cover multiple locations and incorporate elements beyond machines and plants – such as energy installations, building services engineering, logistics, and the systems at partner companies along the supply chain.

Industrial software has long outgrown the strict boundaries of the automation pyramid. "Today's software must be ergonomic, open, flexible, and scalable, but also reliable too," explains Thomas Punzenberger. "Only then can it form the basis for industrial automation solutions that are customized and adaptable – making them forward-looking too."

Keeping pace in a technological world that is marching ever faster on the path towards progress.

ZENON IS HERE TO STAY

As software for interaction between humans and machines, as well as for data acquisition, visualization, and control, zenon has gained worldwide recognition and won considerable acclaim over recent decades. In particular, it has achieved significant currency in the HMI and SCADA product categories. Nevertheless, we have always listened attentively to our users and addressed other fields of application where zenon can help to achieve better results more easily. As a result, zenon offers an extremely versatile basis for numerous applications in production, power distribution, and infrastructure management.
As a reflection of zenon's development, in the future we will be positioning zenon as a software platform. This is a better fit for a world that has left behind the old paradigm of the automation pyramid.

CAN SOFTWARE BE FUTURE-PROOF?

In the context of capital goods, there has always been a great deal of concern for ensuring that investments are "future-proof." The focus is on investments that stand the test of time and deliver the desired level of added value over their complete lifecycle. In an environment where software is undergoing constant change, it is worth asking ourselves how future-proof an investment in software will be. Indeed, can software ever really be future-proof?

Those who are familiar with zenon will know that this issue has always been one of our company's preoccupations. We have committed ourselves to investing in development on an ongoing basis, so we are constantly introducing new product versions to the market. However, we are always very careful to maintain compatibility, making sure the latest zenon versions will still be suitable for use with – and for the development of – existing applications and projects.

Since 1987, our promise has been to make zenon a software application that delivers long-term return on investment and, thanks to its continuous development, ensures sustained added value. On that score, nothing has changed and nothing will change.

COMBINING LONG SERVICE LIFE WITH AGILITY

The typical service life of plants and machinery in the production and energy sectors is between 15 and 25 years. Traditionally, the software that used to operate these systems was supplied along with them from the start and remained unchanged over their entire lifecycle. Even higher-level systems were, for a long time, constrained by structural considerations, and they often remained in operation, unchanged, until they were eventually replaced. In such circumstances, problems began to arise when underlying hardware failed and replacement hardware or the original operating system was no longer available.

At a time when more and more applications are interconnected, these structural concepts are no longer practical when it comes to software. Security demands, coupled with the need to maintain compatibility with the rest of a company's IT provision, have made continuous patch management and a long-term update strategy an absolute necessity. zenon offers a solution to these challenges thanks to its thoroughly consistent compatibility. zenon makes it easy to migrate to newer operating systems and zenon versions.

THE CHALLENGES OF (TODAY AND) TOMORROW

Although the production and energy sectors have significant differences, there is a common thread that unites them both. If we want to meet the needs of the future and make good on our value proposition, we need network-capable and agile systems with distributed intelligence and integration along the entire value chain.

In the production sector, the essential goal is to engineer systems that meet the growing demand for customizable solutions – even down to lot sizes of one. In the energy sector, the goal is to build an infrastructure in which renewable energy accounts for a majority of the energy generated. For both industries, our promise is to provide added value for end consumers. And, in order to pursue this objective, software will have to take on the challenge when it comes to adaptability.

Figure 1: Maintaining efficiency, agility, and reliability over the entire lifecycle of plants and machinery.

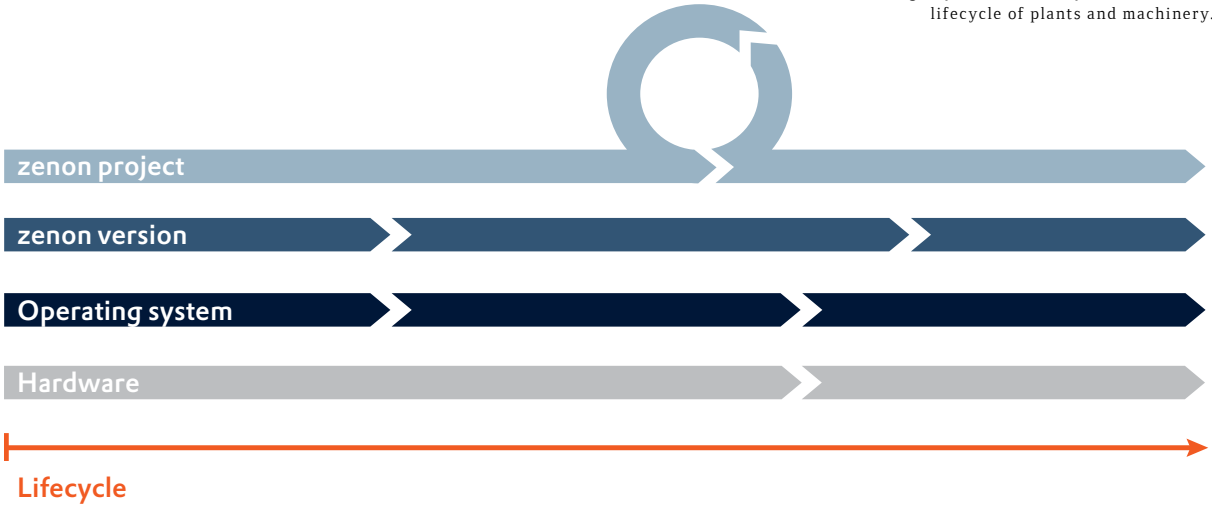


Figure 2: The four key elements of future-proof software.

REMAIN FUTURE-PROOF WITH ZENON

zenon's future-proof qualities are based on four key elements:

1. Long-term compatibility of existing projects and applications with new software versions
2. Continuous updates and development of software features
3. Long-term application maintenance capabilities
4. Ability to adapt to IT requirements

LONG-TERM COMPATIBILITY OF EXISTING PROJECTS AND APPLICATIONS WITH NEW SOFTWARE VERSIONS

A lot of capital is invested in applications that are customized and continuously adapted. All too often users find that, when upgrading to a new generation of software, previous engineering efforts become obsolete and applications have to be partly or wholly rebuilt. This is different with zenon. When upgrading, for example, applications can be migrated to later versions of zenon easily and without any loss. This means there is no need to write off or repeat any of the engineering work that has already been completed, and the deployment of a new zenon version does not pose a huge challenge. This principle is also applied in the future development of zenon, allowing us to offer our users long-term agility and return on investment.

CONTINUOUS UPDATES AND DEVELOPMENT OF SOFTWARE FEATURES

As an independent company with a clear focus on our core product, we are committed to continuing the development of zenon. One focal point of our ongoing development comprises the non-functional aspects of zenon, such as scalability, performance, durability, and security. Another focus emphasizes the addition of new features to zenon, so we extend the platform to cover an even broader spectrum of applications. Some of the recent features added include functionality for grid control systems in the energy sector, as well as workflow management, which helps users implement efficient, transparent, and paperless workflows both in production and in mechanical engineering. This will allow us to broaden the scope of interdisciplinary synergies leveraged with zenon through the combination of different applications.

LONG-TERM APPLICATION MAINTENANCE CAPABILITIES

How can we flexibly make improvements to existing applications while also satisfying the stability and security requirements of the production and energy sectors? zenon already includes a powerful combination of a central engineering concept and a robust approach to maintaining compatibility. This allows zenon to eliminate a large part of the complexity that project engineers face when adding features to and maintaining large-scale applications. And as business architectures become more extensive, networked, and interdisciplinary, we will continue to empower users with long-term compatibility and easy-to-maintain applications.

ABILITY TO ADAPT TO IT REQUIREMENTS

The automation processes of the present and the future are no longer independent from corporate IT and are increasingly integrated into the overall architecture of both individual businesses and entire supply chains. As a result,

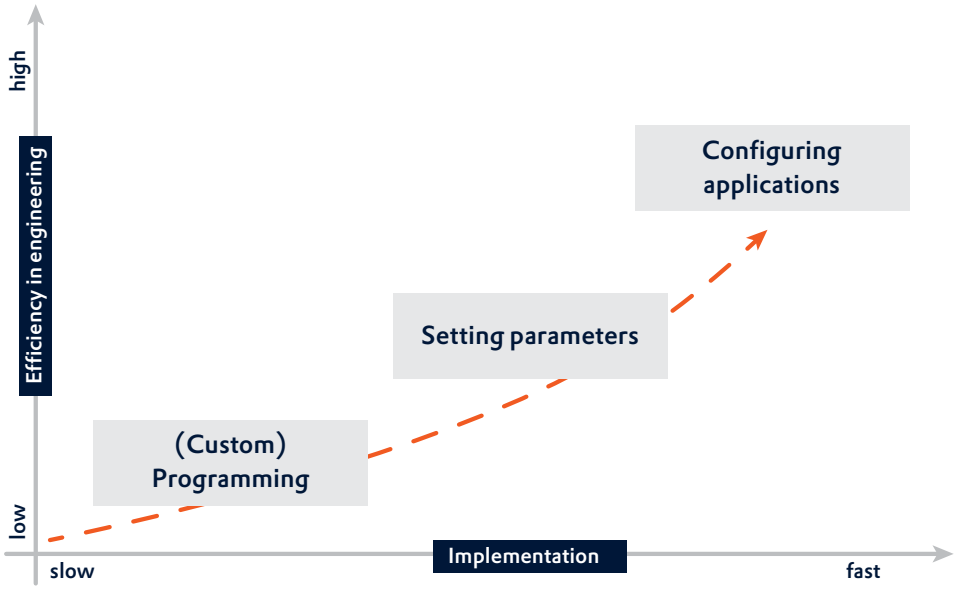


Figure 3: Adaptable applications enable even more efficient engineering and quicker implementation.

all applications are affected by the same general conditions. Because these conditions (which include communication protocols and visualization technologies) change over time, our strategy is not to focus on the short term by only looking at current trends, but rather to remain adaptable to these conditions on a long-term basis.

A VERSATILE SOFTWARE PLATFORM

The zenon software platform provides a technological basis for numerous applications in the manufacturing and energy sectors. In contrast to a software system, which is built for a specific purpose, a software platform provides the foundation to build numerous different applications. Users benefit from a consistent engineering environment and the ability to integrate individual applications. In production companies, for example, this enables the integration of energy data management with the monitoring of production processes, thus providing more powerful insights. To take an example from the energy sector, it allows public utility companies to conveniently and efficiently link the control of local power distribution and other media supplies like gas and water. The universality of the zenon software platform already exists today and will be a guiding principle for future development.

APPLICATION PACKAGES – A NEW MILESTONE IN EFFICIENT PROJECT CREATION

The fundamental concept behind zenon is to build an adaptable software platform for which out-of-the-box functionality removes much of the complexity faced by engineers when creating applications. It is an idea that still has currency today and is reflected in all of the new features added to the zenon platform. For example, zenon can be used to build complex batch applications without any need for code. Incredibly useful features such as the Process Recorder can be implemented virtually at the push of a button.

But in our mission to make life as easy as possible for our users, even that doesn't go far enough for us. With the introduction of application packages, we are about to usher in a whole new era of efficient project creation.

Application packages make it possible to configure core functionalities such as networking, visualization, and data analysis, while also permitting the configuration of entire applications, largely removing the need to engineer individual components.

The first zenon application packages and the new core functionalities associated with them will be available on the market in 2019.

INTERVIEW

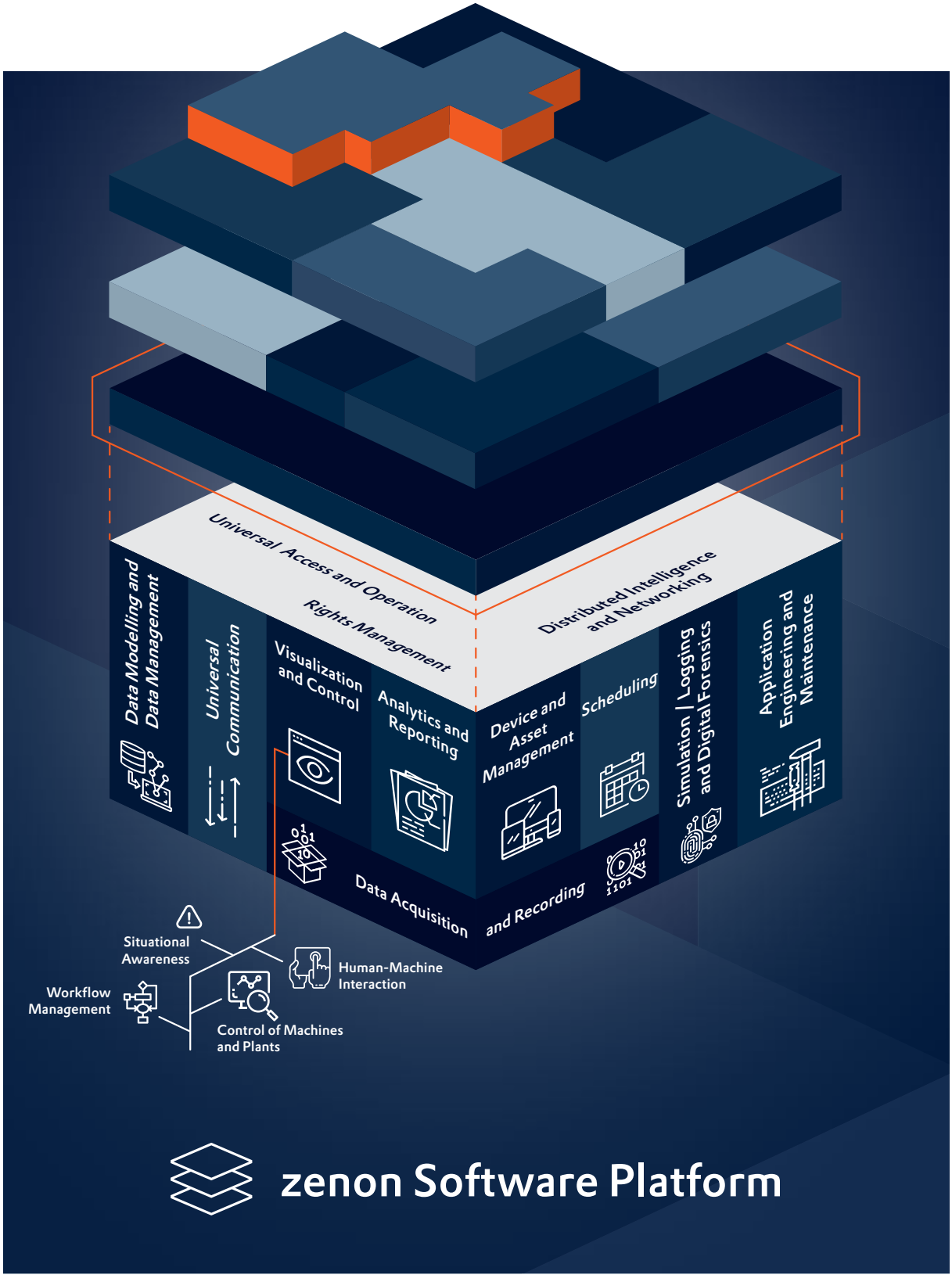
with Thomas Punzenberger – founder and CEO of COPA-DATA, as well as the inventor of zenon.

Thomas Punzenberger, CEO and founder of COPA-DATA, looks toward a bright future

zenon gained prominence as an HMI/SCADA system. Now COPA-DATA is positioning zenon as a software platform – what has changed?
It wasn't something that happened overnight. It's an evolution that has been ongoing for many years. Right from the beginning we provided zenon with the standard HMI/SCADA features. Since then, we have been constantly adding to the spectrum of functionality we offer, and there's been a significant boost in development activities in the last eight years. For example, we have been developing extremely powerful reporting and business intelligence features as well as a fully-fledged batch control system. And for the energy sector, we have made zenon suitable for deployment in distribution management and in electrical substations. Due to the wide variety of applications that can be implemented with zenon on the same technological platform, we made the decision to begin positioning zenon as what it has now become: a software platform for the manufacturing industry and energy sector.

Customers of many years will have benefited from the seamless compatibility of the latest zenon versions and the continuous evolution and development of new features. Will they still be able to harness these advantages in the future?
Yes. Compatibility and long-term reliability will remain central characteristics of zenon. We are committed to ensuring that zenon projects maintain longevity and amenability to maintenance, while being able to adapt flexibly to the needs of the future.

Figure 4: The zenon Software Platform offers a wide range of capabilities.



COPA-DATA was founded in 1987 with the mission of making life easier for automation engineers. What does that mean exactly?
The founding principle was to just set parameters in order to build software applications in automation more quickly, more reliably, and with enduring success. The first areas of application were in machine data acquisition, visualization, and the monitoring and control of machines. Since then we have expanded on this range of features considerably.

How relevant is this founding principle today?
It's more relevant now than ever. The complexity of applications is growing steadily and is set to increase dramatically over the next few years as a result of the departure from standalone solutions in automation. Today, every production site and control level should be connected – ideally beyond the shop floor and including business areas not directly involved in production.

Amid the growing complexity, the idea of software that makes things as simple as possible for users and gives them new dimensions of freedom is more relevant than ever. For me personally, evolving this idea in order to meet the needs of today's world is a fulfilling and fun challenge.

When COPA-DATA was founded, only automation engineers were concerned with automation software. Today, the lines between automation and business IT infrastructure are becoming blurred – a phenomenon known as IT/OT convergence. For us, this means that we can support a growing user base with zenon.

What are the trends in software development and deployment that COPA-DATA is currently pursuing?
zenon is typically used in facilities with machines and systems that have lifecycles of over 15 years – in extreme cases, running up to and beyond 30 years. In order to keep up with ongoing developments, it is essential to keep renewing zenon, especially so that it maintains great performance and reliability characteristics. But it's also really important to avoid putting the cart before the horse and end up trailing behind current technology trends. The technology decisions that we make today must result in reliable long-term advantages for our customers. Over the last 30 years we have managed this very well, and I'm confident that we will continue to do so in the next 30 years as well.

The developments planned for the next few years are set to become major milestones in the development of zenon. What exactly can we expect?
The disappearance of standalone solutions in automation, the growing connectivity of all production processes and business areas, and increasing flexibility place completely different demands on application architectures than before. We will soon be able to give our users much more freedom and flexibility to choose the IT environment in which zenon will operate, as well as which front-end technologies will be used.

Crucially, we will maintain a central engineering environment to keep applications efficient and maintainable in the long term. That's absolutely essential for ensuring that applications implemented using zenon can continue being developed and adapted.

All of our new developments are based on the same values for which we've always stood: efficient engineering, durability, performance, long-term compatibility, openness, flexibility, and scalability.

Where do you see zenon in 30 years' time?
Obviously, I'd need a crystal ball to see 30 years into the future! But what I can say is we are committed to ensuring that, in 30 years' time, zenon will still have its finger on the pulse of technology and will still be making life easier for our users – better than any other software, in fact! Because that's what we're all about.

THE INTERVIEW WAS CONDUCTED BY PHILLIP WERR, CMO/COO AT COPA-DATA.


Predictive Analytics Trend
28.11.2017 13:30:00 - 28.11.2017 14:30:00
Car Production#Welding
R3_ServoCurrent
Car Production#Welding - R3_ServoCurrent
Timestamp
Value

PRODUCTS & SERVICES

2018 ZENON RELEASE

All the Highlights of the New Version at a Glance

The new version of zenon offers structural improvements, better performance, more user-friendly features, and improved analytics capabilities. For the energy sector, it provides new functions that make it easier to manage distribution grids. Here you can read about the advantages of these new features.

IMPROVED USABILITY FOR ENGINEERING AND APPLICATIONS

Addressing the issue of user-friendliness, we have invested a great deal of energy in providing intuitive and efficient project creation capabilities. With a view to helping newcomers in particular, configuring images and symbols is now much easier. Our GUI experts have conducted usability tests in order to simplify the dialogs and give them a more intuitive design. Not only does this make it easier for beginners to get started with engineering work, it also ensures that project creation is both simpler and quicker for advanced users.

Of course, user-friendliness was also one of our focal points for users of zenon projects. For example, the improved usability of touchscreens for batch recipes in the Batch Control module has delivered some significant improvements, making it easier to manage batch processes directly from the machine's touchscreen panels.

THE EXTENDED TREND MODULE REIMAGINED

In the process of developing new usability features, we gave special consideration to the Extended Trend module. The numerous innovations and optimizations ensure the

module is easier to use, benefiting both project creators and users in equal measure. In particular, this has made the design of engineering features much more efficient. Graphical displays of archived data can be configured more easily and intuitively, equipping the project creator with the best possible tools for creating attractive charts.

For instance, index substitution, which is already an established feature in zenon, is now also available for curve variables. This enables you to create screens with trend displays more quickly and efficiently.

Another area of focus was on making it even easier to design trends with appealing graphics. The display of curves, axes, and the diagram itself can now be predefined and applied using the Styles functionality.

For users of the finished applications, it is now even easier to obtain the exact relevant information needed. It is possible to drag and drop project variables into the diagram window of the Extended Trend module using the native environment. This way, users can create the diagram they want, containing the information they need, with just one click – and gain a much better overview as a result. A customizable pop-up screen provides quick information relating to a specific variable. And right-clicking provides a quick preview of the trend.

Figure 1: Reports for statistical process control make it possible to conduct a statistical analysis of production quality at the touch of a button.

SHIFTS AND QUALITY IN FOCUS

The new version makes it possible to conduct meaningful analyses of production that take shift data into account. Historical process data in the Alarm Message List, the Chronological Event List, or even in trends and reports can be filtered based on specific shifts. These analyses make it possible to optimize production processes with regard to different shifts.

You can now apply statistical process control (SPC) in order to optimize production. At just the touch of a button, the new version of zenon delivers reports for statistical analyses of production quality. Alongside the standard *Process Capability, Control Chart,* and *Histogram* SPC reports, zenon also provides additional statistics reports. A box plot, trend with limits, or XY trend can be used to measure and ensure quality in production or pilot production. Equipped with these analysis tools, you can monitor the stability of production quality. This allows you to identify deviations at an early stage and avoid production losses due to inadequate quality.

A GLIMPSE INTO THE FUTURE WITH PREDICTIVE ANALYTICS

The new version has also paved the way for Predictive Analytics, providing a glimpse into the future. Predictive Analytics enables decisions to be made based on past data with the assistance of forecasting models. The zenon application supports two different types of forecasting: time-based forecasting focuses on how a value will develop over time, while value-based forecasting shows how a value will behave if another value changes (this can be used for forecasting energy consumption in the event of a change in production quantity, for example). The Prediction Model Manager has been introduced as a new tool for configuring forecasting models. It includes wizards for the step-by-step creation of forecasting models. The zenon philosophy of setting parameters instead of programming is also applied to Predictive Analytics.

NEW FUNCTION FOR REPORTING: CALCULATED FIELDS

The engineering of reports has also been made more flexible. The Calculated Fields feature enables the data collected to be modified so that it is suitable for custom calculations. Converting one measuring unit into another and merging or adding data are just some examples of the many applications in which Calculated Fields can be used. The function increases flexibility in reporting because reports can be customized to meet a user's own specific requirements. For those responsible for creating projects, this means faster engineering than in the past.

DISTRIBUTION MANAGEMENT IN ENERGY AUTOMATION

Turning to energy automation, zenon now features additional functions for Distribution Management systems. Two brand-new modules – Load Flow Calculation and State Estimator – enable grid calculations in the context of energy distribution.

These can then be used to derive further calculations, such as topologic interlocking from the grid calculation or

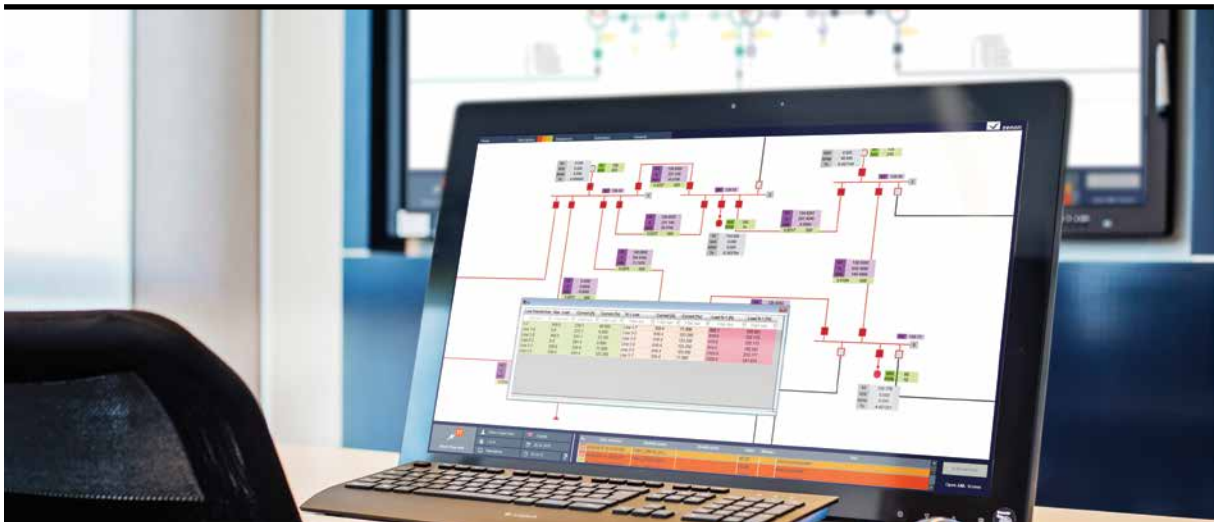


Figure 2: The new Load Flow Calculation and State Estimator modules have been developed specifically for distribution management in energy automation.

(n-1) calculation. zenon therefore enables you to conduct calculations in advance to determine whether activating a switch will overload parts of the energy grid, and if so, to what percentage. Alternatively, it can be used to determine whether the failure of one component in the grid could lead to the failure of another.

FUTURE-PROOF LICENSING

The current version of zenon sees the introduction of a new licensing system that is future-proof and based on the latest security standard. The new license manager ensures a better overview and more flexibility as users can manage their software licenses independently and more quickly.

PERFORMANCE IMPROVEMENTS

At COPA-DATA, we continually invest development resources in improving performance. This year the focus was on data distribution, networks, redundancy, and cyclical archiving. Under test conditions, more than 10,000 variable modifications per second were created in a single image thanks to optimized data distribution between the driver and runtime. Through technologies like multi-threading, the performance of network redundancy is boosted by up to 50 %. Furthermore, stress tests have revealed a writing speed of 250,000 variables per second for cyclical archiving.

MANY OTHER NEW FEATURES

The new version of zenon naturally has a lot more to offer. We only have a little room to address some of these here – like the automated release of master recipes in zenon Batch Control, which enables fully automated workflows. Or the new driver for alternative data points, which prevents data loss and increases the validity of recorded data. Plus, there's the new user administration features, such as the new "Power User" status, and much more.

Want to find out more? Get in touch with your local contact person.

HIGHLIGHTS AT A GLANCE

- **More usability:** Comprehensive improvements to the Extended Trend module, user-friendly creation of symbols and screens
- **Improved analytics:** New analytics options thanks to shift filters, statistical process control reports for ensuring production quality, and Predictive Analytics for value-based or time-based forecasting
- **Structural improvements:** Better performance, new and more flexible licensing
- **Energy distribution:** New modules for grid calculations

ANDREA MITTERER,
PRODUCT MARKETER

SECURING A SECURE ZENON SOLUTION WITH IEC 62443

COPA-DATA and TÜV SÜD have a long history of productive collaboration. In this article, we consider which parts of this standard are applicable for an independent software vendor such as COPA-DATA and why certification makes sense.

In general, for a product vendor like COPA-DATA the relevant parts of the standard are:

- **IEC 62443 3.1** – Security technologies for industrial automation and control systems
- **IEC 62443 3.3** – System security requirements and security levels
- **IEC 62443 4.1** – Secure product development lifecycle requirements

While the first two parts can be seen as taking a more technical approach towards the topic, part 4.1 deals with necessary basics, such as planning and development processes and Quality Assurance (QA) activities. Part 4.1 is therefore the more important focus for COPA-DATA, since any future product or feature development will be based on the process and policy optimizations implemented.

STANDARD AND DEFINED PROCESSES FOR MANAGING THE PRODUCT DEVELOPMENT LIFECYCLE

Essentially, IEC 62443 4.1 specifies the process requirements for the secure development of products used in industrial automation and control systems. It defines the requirements for a secure development lifecycle (SDL) that should be applied to any product within an industrial automation and control systems environment.

The lifecycle description includes:

- a security requirements definition
- a secure design
- secure implementation (including coding guidelines)
- verification and validation
- defect management
- patch management, and
- security information management.

These requirements can be applied to existing processes for developing, maintaining, and retiring software such as zenon. The current version of this part was released on January 15, 2018, and is not scheduled for review until 2022.

HOW IEC 62443 4.1 UNDERWRITES THE SECURE, HIGH-QUALITY DEVELOPMENT OF ZENON

Now, let's take a look at what that means for you, as a zenon user, what happened at COPA-DATA and how we adapted to meet the requirements of the standard and TÜV SÜD.

First of all, COPA-DATA created a Security Management Team (SMT). Under the standard, this team should work together for the full duration of one development lifecycle or, in the context of COPA-DATA, for the duration of one zenon release.

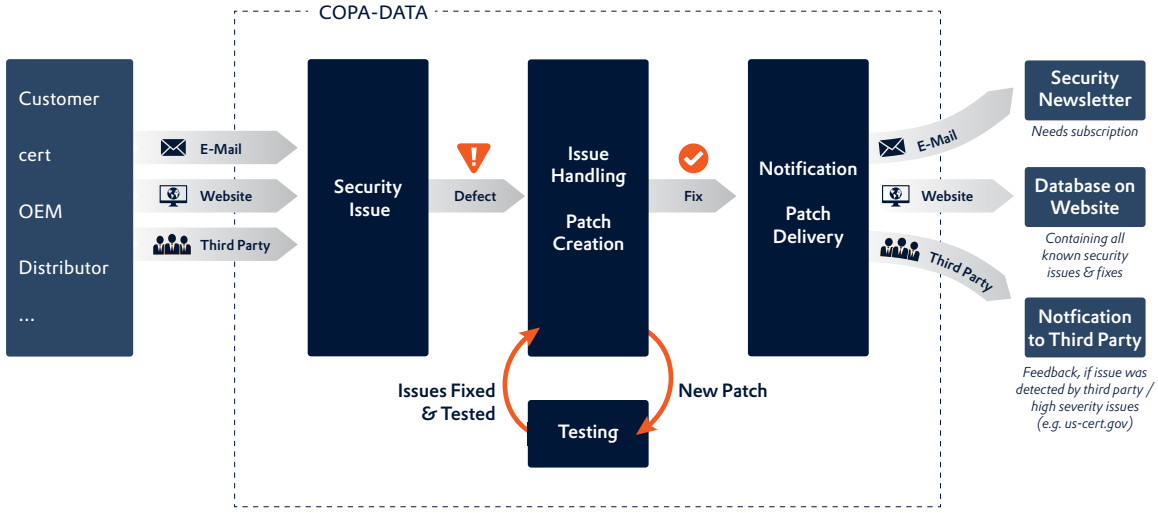


Figure 1:
Security issue management at COPA-DATA

The team's primary responsibility is the planning, monitoring, and communication of security enhancements concerning COPA-DATA products and services. The team is also responsible for the monitoring and communication of possible security issues relating to built-in third-party components. If and when any vulnerabilities related to these components are discovered, COPA-DATA will trigger its communication process to inform our customers about the issue.

Throughout the lifecycle another important responsibility of the team is the monitoring and evaluating of the security-related processes which we have implemented at COPA-DATA. As such, they perform a very important role within QA Management and in terms of continuous process optimization.

SECURITY THREAT MODELLING AND THE PRIORITIZATION OF ISSUES

Another important innovation was the introduction of threat models and prioritization of security issues based on a Common Vulnerability Scoring System (CVSS). The process of using threat models is an effective way to manage potential threats for complex systems such as zenon. The SMT uses this method to search for structural vulnerabilities from the point of view of a potential attacker. This model helps us – as a "defender" – to perform a systematic analysis of potential attack vectors, as well as gain a clear understanding of the assets most desirable to an attacker. These threat models provide answers to the most important questions in a security context: "Where are my valuable assets?" "Where is my greatest vulnerability?" and "What are the most pressing threats?"

Based on these threat models, the SMT gains a far better understanding of where product optimizations – in the form of features or structural enhancements – are necessary.

Using a CVSS to rate the identified threats is the next step. With the help of the score it is possible to determine the severity of identified security vulnerabilities. In this way, this open industry standard makes it possible to give a clear prioritization to the identified threats. As well as being an excellent way to prioritize issues, using such a score is a good way to get a very clear idea about the resources needed to address the threat.

Scores are calculated with standardized tools which reflect the ease of exploiting the vulnerability and the impact of the exploitation. Scores range from 0 to 10, with 10 being the most severe (https://nvd.nist.gov/vuln-metrics/cvss/v3-calculator is a typical example). At COPA-DATA all recorded security bugs and feature requests are rated based on this scoring system.

THOROUGH SECURITY TESTING, PLUS ENHANCED QUALITY ASSURANCE AND CUSTOMER SERVICE

Enhanced QA strategies were also addressed as part of the security process implementation at COPA-DATA. We

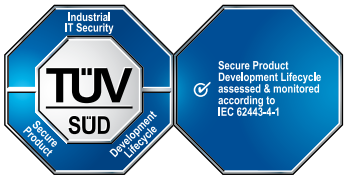
COPA-DATA is certified according to the ISA/IEC 62443-4-1:2018 security standard. In the image: Mark Clemens (left) and Reinhard Mayr (right) with the TÜV SÜD certificate.

introduced in-house penetration tests in addition to our existing QA activities. These are performed for every zenon release. We use two different penetration testing methods: blind testing and internal penetration testing.

A **blind test strategy** simulates the actions and procedures of a real attacker by severely limiting the initial information given to the person or team performing the test. Typically, they may only be given the name of the company. Because this type of test can require a considerable amount of time for reconnaissance, it can be expensive.

We also introduced **internal penetration testing**, a test which mimics an inside attack from behind the firewall by an authorized user with standard access privileges. This kind of test is useful, for example, for estimating how much damage a disgruntled employee could cause.

COPA-DATA is currently in the first year of implementation of all these new standards, procedures, and tools. We are already seeing a positive effect on our products and processes. Not only that, but through the formalization of the standard, our customers know they can rely on our professional handling of all security issues – not only within the product and its features but also, of course, in terms of professional communication and **issue management**.



REINHARD MAYR,
HEAD OF INFORMATION SECURITY AND
RESEARCH OPERATIONS

FAQs

zenon as a Software Platform

What's changed and what's staying the same? This is where you'll find the answers!

Digitization, which initially took hold in our private lives and is now finding its way into industrial settings, makes it necessary for all organizations to rethink their portfolios of products and solutions – and even their entire supply chains and business models. Only organizations that do this will maintain their ability to compete in the long term. Read on to find out why zenon as a software platform can make a genuine contribution to innovation, and what new options will be supported by the new release in 2019.

Why does zenon need to be positioned as a software platform?

More and more processes are being automated. More and more information is going digital. "Things" are connecting and communicating with each another. As a consequence, the amount of data being generated is increasing at a phenomenal rate. But data cannot add value on its own. It is the processing of this data that provides the basis for creating added value.

The emergence of intelligent machines, intelligent devices, and intelligent software is making entirely new industrial applications possible. These applications are breaking through boundaries of disciplines that were previously totally separate. Production data is no longer held separately from data generated from other areas of an organization. And data from one production site is no longer isolated from data from other production sites, wherever they might be located in the world.

If entire supply chains are to be digitized, Operational Technology (OT) and Information Technology (IT) must be perfectly aligned. The Internet of Things (IoT) and cloud technology are driving forward intelligent data generation, storage, and processing. This provides the basis for the transformation of manufacturing and utility companies into intelligent factories and intelligent supply companies. The concept of the Fourth Industrial Revolution is encouraging the development and implementation of new scenarios in production. What's more, these new scenarios are challenging the traditional automation pyramid as we know it. In an intelligent factory, the production area (the field and production levels) is no longer separated from the higher-level control system or even from production planning

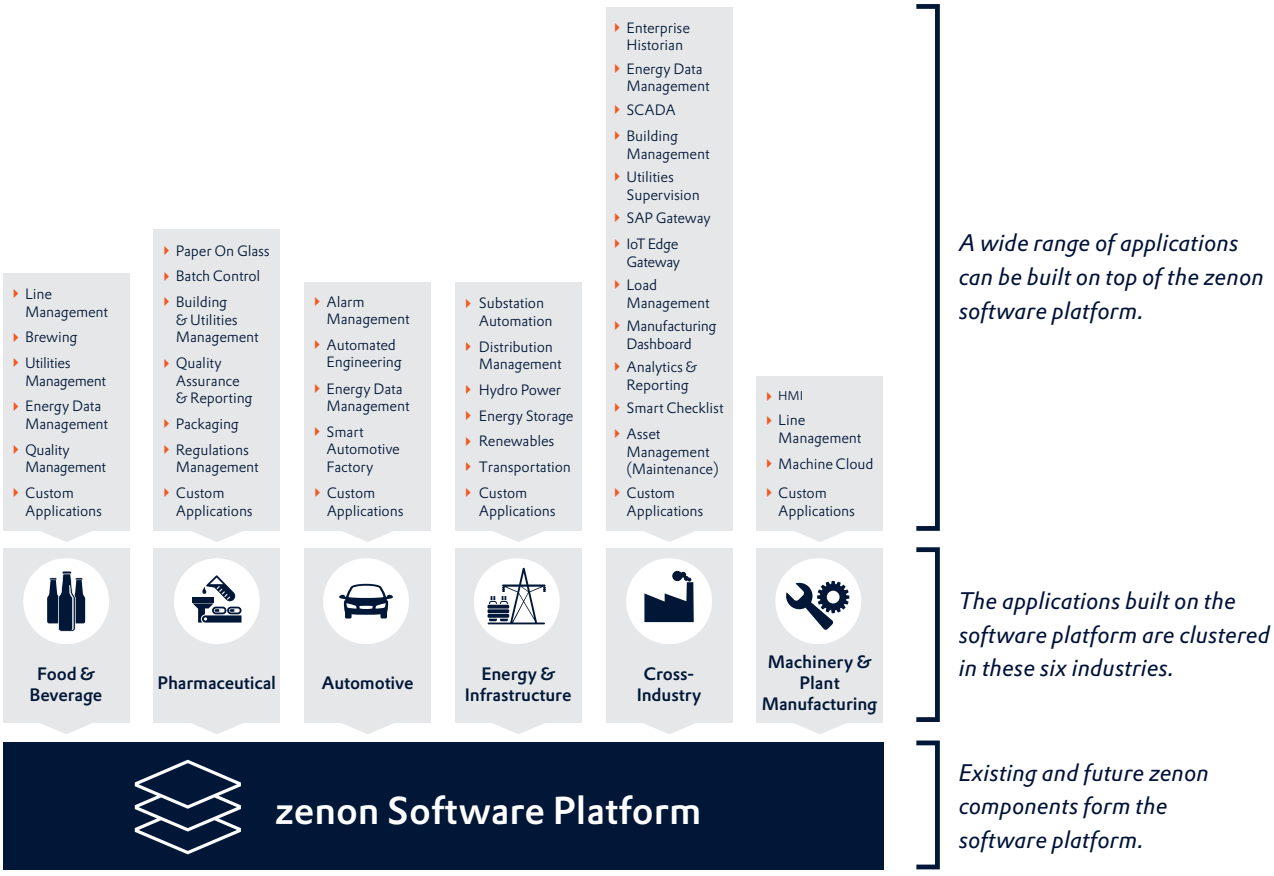


Figure 1: The zenon Software Platform

or controlling. Instead, we are seeing interdisciplinary, flexible, scalable, and open architectures.

In these new architectures, earlier categories such as Human Machine Interface (HMI), Supervisory Control and Data Acquisition (SCADA), Manufacturing Execution Systems (MES), and Enterprise Resource Planning (ERP) can no longer be treated as isolated levels or layers.

This doesn't mean that functions in these categories no longer exist, but that modern architectures are combining them. Treating these categories as isolated levels is out of date and no longer meets the requirements of our developing industrial environment.

What exactly does the new positioning look like?

The progress of digitization and the associated changes to the industrial landscape have made it necessary for us to keep refining our portfolio of products and solutions.

Versatile information flow beyond traditional levels and across crumbling boundaries that previously separated different disciplines requires a new way of thinking and more modern approaches.

Positioning zenon as a software platform is an accurate reflection of what it actually is – a platform that offers several possible applications. Not only that, but this approach also provides a future-proof foundation for developing zenon further.

In the future, our existing products will come together and collectively make up the zenon software platform. You will still be able to purchase existing products, such as zenon Supervisor, in the current configurations. You can also, of course, continue to implement a whole range of different applications based on the software platform.

In addition to the ability to create entirely customer-specific applications, we will be offering what will be

known as "application sets" in the future. An application set for line management in the Food & Beverage sector, for example, contains not only the necessary technological components but also ready-made project templates to enable applications to be engineered much more quickly. What is important is that everything is based on the same platform and can be combined as well as expanded and adapted individually.

Machine builders and OEMs are continuing to use individually bundled runtime systems which are also based on the technological components of the zenon software platform.

With the new platform offering, we want to show even more transparently what zenon can do and where it can add value, entirely independently of previous categories such as HMI or SCADA.

What are typical areas of application and how can I benefit from the platform?
Let's take the Energy and Infrastructure sector, one of our four key industries, as an example. Currently, our industry-specific zenon Energy Edition software supports the efficient engineering and integration of energy projects for the generation, transmission, and distribution of power. It is a clever solution for a wide range of applications.

The possible areas of application in energy automation differ greatly from each other. The features and functions required to control a hydroelectric power plant are not the same as those required to store energy. For this reason, in the future, we will be delivering application sets to meet these individual needs. The zenon projects and symbols supplied with these sets reduce implementation time. You will benefit from being able to deploy a solution with zenon even more quickly.

The application sets support a number of areas of application in the Energy and Infrastructure sector, including:

- Substation automation
- Distribution management
- Automation of hydroelectric power plants
- Energy storage systems
- Power generation from renewable energies
- Substation automation in rail-bound transportation and control of auxiliary tunnel systems

Is it possible to use zenon to run multiple applications and even create interdisciplinary links?
Yes, it will be possible to combine multiple applications in a central integration project in the usual way. For example, you can "marry up" your line management and energy data management centrally and benefit from correlating production and energy data. This provides the perfect opportunity to tap into synergies and better identify potential for improvement.

What additional opportunities does zenon offer?
The amalgamation of familiar technology components in the new software platform combined with the new application sets will enable you to implement your applications quickly and purposefully.

From data collection through machine operation and beyond to business intelligence, zenon offers an integrated environment for digital transformation.

It enables synergies to be created. Users at all levels – from production through management – can play their part in positive business success that can be measured in the long term.

Does the platform require a new engineering tool?
The zenon software platform builds on known technology components from COPA-DATA and combines these in an entirely new and innovative way.

The central engineering tool for the software platform is – and will remain – the zenon Editor, with its familiar import and export mechanisms and functionalities.

Do I have to acquire more knowledge?
As the zenon software platform builds on known products and modules, you will be perfectly positioned to reuse the knowledge you have already acquired. Even zenon certifications obtained previously will continue to be valid. So, anyone who is able to work with zenon today will continue to be able to do so in the future.

Is the platform compatible with existing zenon installations?
The various compatibility modes in zenon ensure that your intellectual property and your solutions are permanently secure in a zenon project. You can continue to use work you have previously compiled while also benefiting from the new functionalities of the software platform.

You will not have to start projects again from scratch. You simply pick up your work where you last left off. The solution thus expands with the addition of the new options without losing previously compiled projects.

In making the transition to the new platform you will be supported by zenon's familiar compatibility modes including editor, backward, runtime, and online compatibility.

Are the applications that are being implemented on the basis of the software platform scalable?
zenon enables you to start projects small and scale them step by step over long periods of time and across multiple software versions. You can thus gradually develop your production facilities. The automation environment grows in

parallel with them. Your cost risk remains small, because the investment required is closely linked to the development of the organization.

Can I also use the platform to implement "traditional" HMI/SCADA applications?
Applications including local operation of a machine and even a traditional SCADA application continue to be possible with zenon. The zenon platform consists of fundamental components from the COPA-DATA product portfolio and is thus suitable for universal use.

What makes zenon different from software systems on the market and where do I find the benefits for me?
While a software system would have been developed with the focus on serving a specific, predefined purpose, a software platform gives you the option of building a variety of solutions on an existing foundation. With zenon, you can set up a range of different interdisciplinary applications on a single software platform. In the future, your energy data management will be based on the same technology as your line management and can be merged in a central location.

In choosing this type of solution you will not only significantly increase engineering efficiency but also benefit from the assurance of long-term and efficient maintenance of the developed applications.

What does the license model look like?
Our customers currently purchase zenon by paying a one-off license fee. This model is known as perpetual licensing. In addition to this, they can take out a maintenance contract once every calendar year to cover maintenance and support for zenon.

In addition to our existing license model, we will be introducing a new subscription-based model which will include product maintenance and support alongside usage rights for the software.

CHRISTOPH DORIGATTI,
HEAD OF INTERNATIONAL SALES

ZENON RECIPES FIRST-HAND:

TREATS FROM ENGINEER'S KITCHEN

TEXT:
SEBASTIAN BÄSKEN,
PUBLIC RELATIONS CONSULTANT

The Engineer's Kitchen YouTube series, produced by COPA-DATA, has now been running for a good year. In the kitchen of the Salzburg-based development team, zenon specialist Reinhard Mayr chats with experts about specific applications and functions in zenon. The unique way in which engineering is carried out with zenon – by clicking instead of coding – is always at the forefront of the conversation. You can find a brief description of the first twelve episodes below. However, we do recommend you visit the COPA-DATA YouTube channel to get a taste of what's on offer for yourself. Enjoy!

"HEAD CHEF" AND INTERVIEWER:
REINHARD MAYR

As a long-standing zenon specialist at COPA-DATA, it goes without saying that Reinhard Mayr is familiar with almost all of zenon's developments. Nevertheless, in conversations with his colleagues after an Engineer's Kitchen recording, even Reinhard finds himself saying, "Very exciting; I genuinely didn't know that before!"

EPISODE 1

Tips & tricks to speed up engineering in zenon

Expert: Irina

The first episode of Engineer's Kitchen serves up useful tips and tricks for engineering with zenon. It is rounded off with shortcuts and practical design tips – an excellent introduction to working even more efficiently with zenon.

EPISODE 2

Creating project screens with as little effort as possible

Expert: Andreas

A good chef can chop their ingredients precisely and at lightning speed. A good engineer, meanwhile, knows how to use functions like substitution and replacing indices to speed up their project development. This episode shows how that can look in practice.

EPISODE 3

Connecting devices – quick & easy

Expert: Markus

In this entertaining episode, an IEC 61850 IED and an industrial PLC are connected to zenon in no time at all. Mutual communication is established in a matter of moments. It's the fast food of the engineering world.

EPISODE 4

Make your project a feast for the eyes

Expert: Gero

Food should be a feast for the eyes – and so should product design. Modern interfaces should be clear and look good. Styles in zenon help the engineer centrally manage graphical elements and their properties.

EPISODE 5

A recipe for industrial IoT architectures

Expert: Stefan

The advantages of zenon really come into their own in the industrial IoT environment. Automated engineering helps with the integration of equipment and the integrated zenon Gateway enables secure data upload to the cloud – a treat for OT and IT.

EPISODE 6

Energy Management with tailor-made reports

Expert: Thomas

How much energy is required to manufacture each production unit? A modern energy data management system based on zenon Analyzer is designed to give decision-makers meaningful insights from energy and production data.

EPISODE 7

Creating comparison reports in zenon Analyzer Management Studio

Expert: Christoph

zenon Analyzer Management Studio works like a prep kitchen for reports. Thanks to its structured workspace containing practical ingredients and pre-prepared templates, you can use it to create comparison reports at lightning speed.

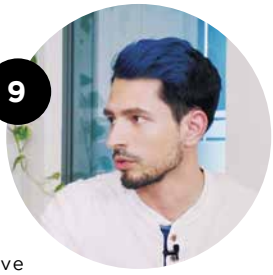
EPISODE 8

Hardware independent batch processing

Expert: Robert

The zenon Batch Control module provides support when it comes to complying with key regulations, such as FDA 21 Part 11. In this episode, Robert explains how PFC recipes are configured in accordance with ISA-88 and how the corresponding parameters are assigned.

EPISODE 9



A recipe for industrial IoT architectures

Expert: Alexander

Kitchens and computers have one thing in common: too many simultaneous processes can bring the chef – or the computer – to its knees. Alexander explains how zenon projects can be cleverly optimized to maintain graphical performance.

EPISODE 10

Integrating zenon projects into existing Active Directory user administration

Expert: Mark

Who has permission to come into your kitchen? You should know who has control over your nutrition – and your computer processes. Mark, our security expert, explains how Active Directory user data can be linked with authorization levels – and much more – in zenon projects.

EPISODE 11

zenon web applications with HTML5 for dashboards

Expert: Sandra

People often expect production data to be presented in web dashboards. In zenon Editor, you can compile browser-independent HTML5 projects to present production data in web dashboards. What's more, you can make changes to the dashboard menu quickly and easily online.

EPISODE 12

Long-term compatibility using zenon

Expert: Wolfgang

If well maintained, a chef's most trusted tools get better with age. So it is with zenon. The compatibility mechanisms in zenon protect intellectual property for projects over the long term. Well-established, long-running projects remain compatible with updated and secure systems.

New episodes from the second series of Engineer's Kitchen are already online. Tip: Use the settings in your YouTube player to automatically translate the English subtitles into your preferred language.

Do you want to start thinking outside the box and get new ideas for your zenon engineering? You can find all the episodes of Engineer's Kitchen using the QR code or at:
www.copadata.com/engineerskitchen

Do you have any ideas or requests for other topics that we should explore on Engineer's Kitchen? Send your suggestions to **info@copadata.com**

INDUSTRIES & SOLUTIONS

FOOD & BEVERAGE

ENERGY & INFRASTRUCTURE

AUTOMOTIVE

PHARMACEUTICAL

RESULTS FROM OUR SECURITY
STATUS QUO SURVEY AND A TASTE OF ZENON'S
CYBER SECURITY CREDENTIALS

FOOD AND BEVERAGE TAKES A LEAD

When it comes to new technologies, the Food and Beverage industry is often an early adopter. Competitive production plants are focused on high productivity and the flexibility of their processes. Today, plants are increasingly automating their data flows, committed to the full integration of production equipment. Growing volumes of data are acquired, transferred, and processed. It is exciting to see the many great opportunities this trend is bringing to the industry, but it is important to also consider the new security challenges it brings.

DIGITALIZATION MUST BE SECURE

In the era of digitalization, automation and IT software platforms are playing a critical role for the reliable and safe production of food and beverages. Together with mechanical and electrical equipment parts, software is the element which controls every single process step. Software ensures that proper recipe parameters are set to achieve the expected quality. It is the interface between operators and machinery, supervising production in real time, analyzing historical data, and integrating with other IT systems. With software playing such an important role, we must consider what could happen without robust cyber security concepts in place.

Imagine the simple scenario of an unauthorized person slightly modifying some set points in a brewing process. The result will be more dramatic than merely unexpectedly changing the taste of the beer. A large amount of costly ingredients may be lost because the batch has been compromised. Even worse, the safety of the brewhouse operation may be endangered.

SURVEY: CYBER SECURITY IN BEVERAGE PRODUCTION

COPA-DATA is conscious of the central role zenon plays in numerous industrial applications worldwide. Our assumed responsibility is manifested in the "security by design" concept of zenon. This is backed up by COPA-DATA's continuous security investment which enables end users, their OEMs, and system integrators to enjoy a high level of cyber security for their applications.

As part of this, we undertook a survey of a number of representatives from nearly 230 companies. The participants kindly gave us their point of view on cyber security. Here's an overview of what they told us.

Cyber Security
in Beverage Production

With trends and initiatives such as Industry 4.0, Smart Factories, Industry of Things, etc., one topic definitely stands out: **Connectivity.**

With the **increased demand** for communication capabilities of machines, it is also important to focus on the topic of **Cyber Security**. Among other things, Cyber Security presupposes that systems are current and **security updates** are carried out in order to best protect from attacks.

SURVEY

We wanted to find out if Cyber Security was a topic of interest in beverage production.

228 companies took part

(Beverage manufacturers and fillers, breweries)

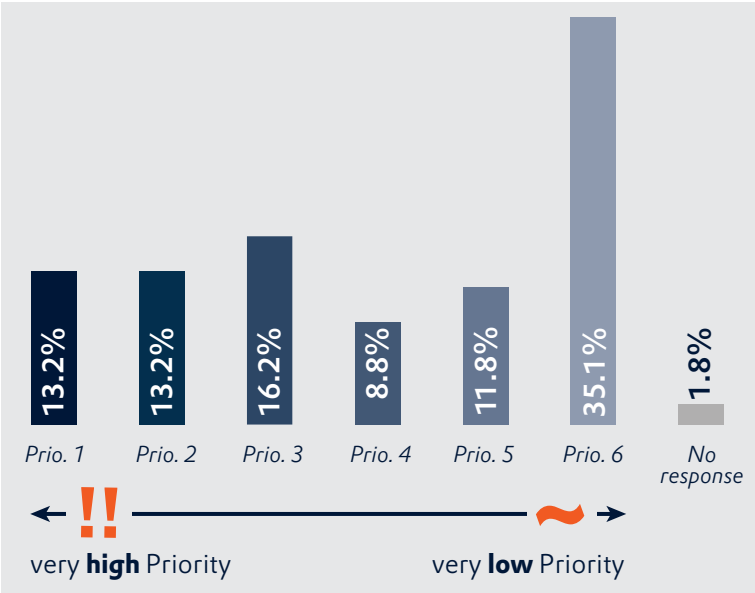
Participants were businesses from Germany, Austria and Switzerland.

Companies of all sizes were represented

PRIORITY

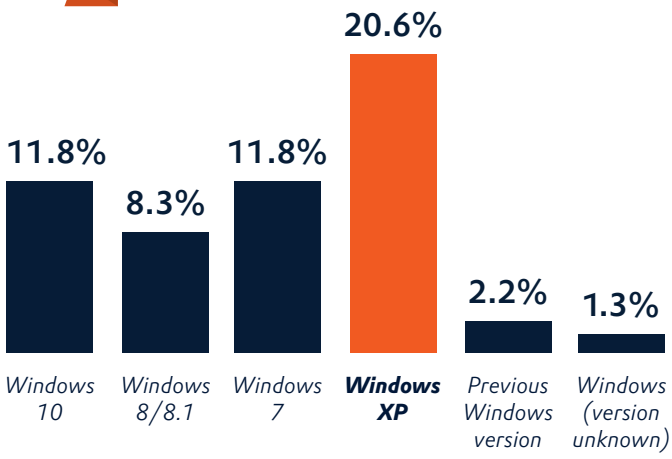
Significance of Cyber Security in production

For 55.7% of those questioned, the topic of Cyber Security in production had a low priority.



The larger the company (measured on the output), the higher the topic of Cyber Security in production was prioritized.

WINDOWS OPERATING SYSTEM



According to our survey,

Windows XP

is the most widely used operating system in beverage production.

Every 5th company

still uses Windows XP. Outdated systems present a substantial security risk, as none of the relevant updates are available.

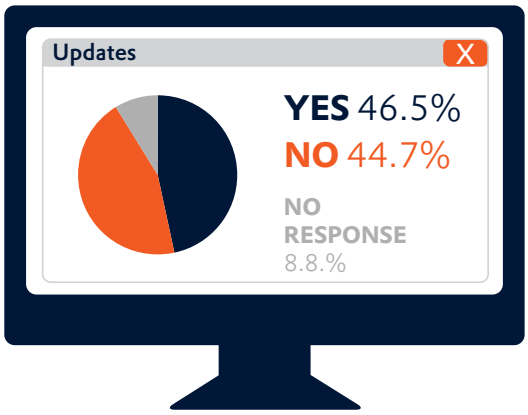
RESPONSIBILITY

Who is responsible for Cyber Security in production?

Production team	**43.0%**
IT team	**19.7%**
Production and IT team in collaboration	**7.5%**
Production team in collaboration with another team	**3.1%**
IT team in collaboration with another team	**1.8%**
External consulting companies	**8.3%**
CEOs or owners	**5.3%**
Maintenance and/or electrical engineers	**1.8%**
Quality management or data security engineers	**1.3%**
Other	**1.3%**
No response	**7.0%**

Are there strategies and workflows in the company for system updates?

The strategies and workflows for system updates of software systems are quite varied. They vary according to internal corporate structures, suppliers, contracts, and age of the machines.



STATE OF THE ART?

How did those questioned estimate their production equipment compared to similar companies?

No response	**7.5%**
Very outdated	**2.6%**
Outdated	**11.4%**
Average	**38.6%**
Modern	**32.0%**
Very advanced	**7.9%**

SURVEY: CYBER SECURITY IN BEVERAGE PRODUCTION – OUR FINDINGS

As a software provider who cares deeply about the security of our solutions, we have drawn out several interesting aspects from these survey results.

PRIORITY: REQUIRES ELEVATING

When it comes to cyber security, the business risk is considerable, whatever the size of your business. zenon can help all organizations, whether or not you have a clear cyber security strategy, by advancing the cyber security topic in a pragmatic and straight-forward way. For example, zenon enables IT teams when they implement their security concepts and architectures – from data gateways to adequate communication ports. zenon assures encrypted communication in all directions: default for zenon networking and an on-board options for various data transfer protocols. zenon offers a robust user management with differentiated authorization, either at local level or integrated plant-wide within the Active Directory system. Plus, zenon applications are signature-protected against malicious manipulations.

These are just a few of the many security shields food and beverage manufacturing plants can benefit from when they use zenon.

RESPONSIBILITY: A PROFESSIONAL APPROACH

The predominant opinion held by those surveyed is that production teams should take prime responsibility for cyber security. Here are people who already have wide-ranging responsibilities: productivity, consumption, quality, flexibility, etc. It is true that production teams should define their cyber security demands in so far as they affect the protection of sensitive production data, intellectual property (e.g. product recipes), co-workers' rights and responsibilities, information availability, and communication performance. However, cyber security cannot be ensured without automation and IT specialists. Moreover, it requires the renewed focus of maintenance specialists, electrical engineers, and operators. These organizational aspects must be supported by effective software technology, such as zenon. As exemplified, zenon brings security by design to any industrial application, be it process control, productivity supervision, energy optimization tools, or plant historian and reporting.

UPDATES: BALANCING COST WITH THE SECURITY IMPLICATIONS

Software updates are often perceived in terms of cost of licenses, maintenance, and even integration work – and, as such, part of the total cost of ownership (TCO). How can zenon help here? Importantly, COPA-DATA's philosophy of compatibility between versions makes upgrades simple. First, the user can decide when to update the version of the Runtime (running the zenon application), because even older versions will remain compatible with the newest development environment and other zenon applications

that may be being used elsewhere on the network. Second, all the native components of a zenon application are easy to convert to the newest version – no re-engineering is needed. In this way, zenon users can take advantage of the latest security features with minimum effort.

WINDOWS OPERATING SYSTEMS: PROLONG MACHINE LIFECYCLES

One startling finding from our survey is that one in five companies still use Windows XP – an operating system that was discontinued many years ago, a situation which has increased the likelihood of it having security vulnerabilities. Plants continuing to use it are exposed to high risk from all machines and systems running Windows XP – and those connected to them, whether for data acquisition or remote maintenance purposes.

The high degree of connectivity inherent in digitalized manufacturing makes having a clear update plan for installed operating systems absolutely essential. zenon is kept always up-to-date and compatible with the newest Windows operating systems. This helps production teams to prolong the lifecycle of their machine, thus ensuring they are ready to meet the challenges of digitalization.

STATE OF THE ART: FOOD AND BEVERAGE TAKES A LEAD

Our cyber security survey ends on a positive note – with the estimation by most of the participants that they use state-of-the-art equipment. This harmonizes with the idea that the dynamic Food and Beverage industry is a leader and generally adopts new technologies in their early phase. The challenge now for the industry is to also demonstrate its leadership in the important issue of cyber security by adopting state-of-the-art security technologies.

The cyber security topic brings with it challenges, but also opportunities. Growing competencies and continuously improving security strategies are essential. We have seen how zenon helps but, nevertheless, here at COPA-DATA, our journey goes on. We will continue to develop our cyber security agenda through new research, committed product improvements, specific training, and many other initiatives. Since August 2018, COPA-DATA has also been certified according to the IEC 62443 security standard.

Stay informed about our news on cyber security and subscribe to our Food & Beverage Newsletter.

EMILIAN AXINIA,
INDUSTRY MANAGER
FOOD AND BEVERAGE

ZENON SUCCESS STORY

BIRRIFICIO ANTONIANO'S NEW CRAFT-BEER PRODUCTION

Craft Beer and Industrial Efficiency

To meet the ever-growing demand for its top quality craft beers, the Birrificio Antoniano S.r.l. Company in Padua selected the Treesse Progetti S.r.l. Company and zenon, COPA-DATA's HMI/SCADA software solution, for its new automated brewery.

THE ANTONIANO BREWERY

Birrificio Antoniano was founded in Padua in 2013 as an agricultural brewery. It was a conscious choice to become one with the land that gives the unique flavor to the beer that it produces. The brewery was a "dream come true" for a team of former beverage distributors who remade themselves into craft beer brewers. With a strong love for the territory and being totally dedicated to the quality of its raw materials and products, the Birrificio Antoniano team chose to use craft brewing methods. Under the direction of the master brewer, who guides each stage of production, their approach maintains respect for the raw materials and a commitment to wait patiently for the natural product to mature.

THE REQUIREMENTS

With demand growing on the craft beer market, the management at Birrificio Antoniano realized that the time was right to increase their production capacity by automating their plant. Their goal was for their brewery to increase batch sizes from 500 to 2,000 liters. To achieve this, they needed a new production plant with increased batch production capacity and the hand-made process, thanks to the staff's experience Birrificio Antoniano could make several kinds of beer using an especially flexible production process. In this way, the business got its start on the market by brewing beers that satisfied the tastes of a vast number of beer enthusiasts.

"zenon has met all of the project requirements, especially in terms of the graphics applied to the multi-monitor displays, and for recipe management, where the structure was imported from another system. The trend and reporting functions were also fundamental to this application."

STEFANO GASPARINI,
TECHNICAL SALES MANAGER AT TREESSE PROGETTI S.R.L.

THE INITIAL SITUATION

Birrificio Antoniano used to make several types of craft beers in 500-liter batches using very basic, almost manual, production and process controls. This was handled mainly by the master brewer and his staff. Despite the 500-liter capacity and more automation that would, at the same time, keep the same staff employed in the management of the new brands. The essential objectives were to build a plant with machinery able to optimize the yield of their raw materials, ensure consistent production batch after batch,

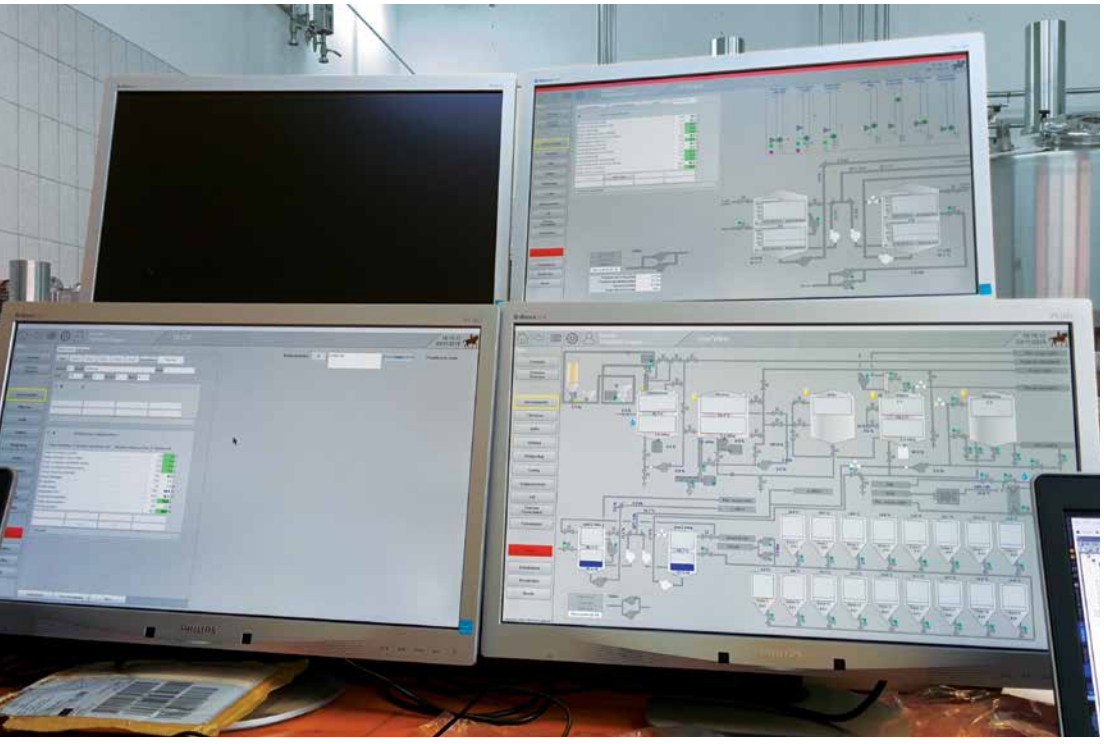


Figure 1: The master brewer can keep track of the entire production process at a glance via the multiple monitors displaying supervision application information in the control room.

and still be flexible enough to change the beers' recipes. This meant keeping close control over the temperature and fermentation status of each tank in the brewery. The same system would then closely monitor and supervise not only the production but also the utilities that the entire brewery used, all from one central control station.

THE SOLUTION

To achieve its objectives, Birrificio Antoniano requested the support of Treesse Progetti S.r.l., which supplies brewing process automation software and systems, based on zenon, COPA-DATA's HMI/SCADA software. In over thirty years of doing business, Treesse Progetti has demonstrated that it is a leader in the field of industrial process automation by offering customized products and services of the highest quality. Over the years the company has specialized in the Food & Beverage industry, especially in beer production. Currently, 70% of all the beer production plants in Italy have installed Treesse software. COPA-DATA is a technological leader in the development of industrial automation software solutions. With its zenon Product Family, COPA-DATA can cover every automation stage – from the sensor to the cloud. Together, Treesse Progetti and COPA-DATA have succeeded in meeting the needs of Birrificio Antoniano.

Their facility has a surface area of 1,850 m2 with a current production capacity of 21,000-22,000 hl/year. It can boil four to five 2,000-liter batches each day, five days a week.

Not only has Birrificio Antoniano increased its production, but thanks to the solution provided, it has increased its flexibility because of zenon's powerful recipe management system. The system is platform independent. It can be built on any type of hardware because of zenon's high capacity for integration with existing plant systems. With its intuitive graphical interface, compliance with the appropriate standards, and adaptability to replicate an existing SQL-based recipe management system, excellent results in overall performance have been achieved.

Figure 2: Birrificio Antoniano with Treesse Progetti and the software zenon went from a production of 500-liter batches to 2,000-liter batches per day.

MINIMAL TRAINING TIME

Following the completion of Treesse Progetti's project using zenon, Birrificio Antoniano went from a near-manual production to an entirely automated craft beer brewing process. The increase in production capacity has been achieved at the same time as gaining greater flexibility and ergonomics in the operators' duties. The staff needed very little training to learn how to use the new applications. This was because the intuitively structured graphical interface was created with high levels of usability, so training time could be reduced to nearly zero.

MULTI-MONITOR DISPLAY

One of the project goals was to be able to manage the entire plant from one single control station. Using zenon, the master brewer now has a control room from where, on the several monitors, he can supervise the entire production process. He can see the status of the recipes being prepared on one monitor. On another, the alarms page is displayed. On another, the complete overview of the entire production line, from the ingredients blending stage to the fermentation process right up to storage, is displayed. All the while, he can keep track of the temperature indicators and the most important production performance levels.

FAST FACTS:

- Increased productivity
- Ergonomics
- Flexibility
- Intuitive graphical interface
- Zero training time
- Multi-monitor display
- Powerful recipe management system
- High usability

CONTACT:

Diego Fila
Sales Engineer,
COPA-DATA Italy
diego.fila@copadata.it

IN FOCUS:

SYSTEMS FOR ENERGY STORAGE

Energy storage systems and their application in modern electricity grids

Today's electricity grids cannot function without energy storage systems. They are used for a wide range of purposes: as control instruments, as buffers for generation and load peaks, and as long-term storage systems. In these applications, battery storage is playing an increasingly important role. The technology is still in its infancy, however, and undergoing constant development. In this article, we look at the ways in which energy storage systems are used today and what role batteries will play in the future.

We are all familiar with storage systems for electrical energy – like the rechargeable and single-use batteries that we find in our household appliances, cars, tools, and machines. They have been used in a myriad of both personal and industrial applications for over 100 years now. But in electricity grids with fluctuating infeed and consumption levels, storage systems need to deal with exceptionally large volumes of energy. This is certainly true of conventional energy generation from fossil fuels, but where it really becomes important is in grids supplied by renewable sources of energy.

NUMEROUS APPLICATIONS

Generally speaking, an energy storage system in an electricity grid must be able to both draw and supply energy. If the storage system is disconnected from the grid, it must be able to operate as an isolated unit.

One way in which users can benefit from the application of a storage system is in the optimization of consumption in a self-contained environment. Alternatively, storage systems can be used to serve the market in a multi-regional grid – by supplying balancing energy, for instance. A third example is voltage stabilization within a grid.

IT ALL DEPENDS ON POWER DENSITY

For nearly 100 years, energy has been temporarily stored on a large scale in pumped-storage power plants. Excess or very low-cost energy in the form of electricity is used to pump water from a lower-altitude lake to a higher one. This moves around massive volumes of energy. The pumped-storage power plant Limberg II in Kaprun, Austria, is one example of this. If the total contents of its lower lake (81.2 million m3) were to be pumped completely into its higher lake, approximately 81,000 MWh would be available. This could then be retrieved with an output power of 480 MW. Of course, this is only a theoretical figure because the lakes are never completely emptied.

If we compare the Limberg II system to the world's largest battery storage system in Mira Loma, California, it becomes clear that the pumped-storage system is not the most space-efficient way of storing energy. The Mira Loma battery-based project consists of 396 power packs, each of which can store 80 MWh and output 20 MW of power. They are situated on an area of just 6,000 m2, whereas the two lakes used by the Limberg II pumped-storage system cover an area of 3.1 km2 – around 500 times larger. As a result, the power density of the batteries would be 21 times higher.

ELECTRICITY MUST BE PROVIDED WHEN CONSUMED

Today's integrated grids operate an AC grid with a frequency of 50 Hz (in Europe, large parts of Asia, and Australia) or 60 Hz (North America and parts of South America). If generation and consumption are the same, the frequency remains stable at this level. If generation is higher than consumption, the frequency will rise. If generation is lower than consumption, the frequency will drop. This is also the reason why frequency-synchronized clocks in Europe were running slow by several minutes at the start of this year: consumption exceeded generation, causing the frequency to fall and the clocks to tick more slowly.

BALANCING ENERGY FOR GRID FREQUENCY

Transmission system operators (TSOs) are the entities responsible for keeping the frequency within a certain tolerance range. To do this, they use primary and secondary balancing energy to counteract frequency variation. Primary balancing energy systems are fitted directly to the turbines of power plants, where they measure the frequency and immediately increase or decrease turbine output if the frequency deviates from 50 Hz. Secondary balancing energy works in a similar way but is performed at a control center rather than at the turbine. In this case, the control signal is sent from the control center to many power plants and turbine controllers with different weightings in order to keep the frequency stable. Additionally, in gas or hydroelectric power plants, tertiary balancing energy is used. This is done by starting up or shutting down the turbines in a matter of minutes. The three balancing types are operated in parallel and are used to ensure frequency stability by matching power generation precisely to current consumption.

WHAT DOES THIS HAVE TO DO WITH BATTERY STORAGE?

A lot! Battery storage systems can be used to supply primary balancing energy – and deliver interesting economic benefits as well. On average, a TSO pays around 100 euros per year for 10 kW of battery power that can be used for primary balancing, regardless of whether the output is needed or not. As an example of this applied to a current project, 10 MW of installed second-life batteries from electric cars could yield 100,000 euros per year.

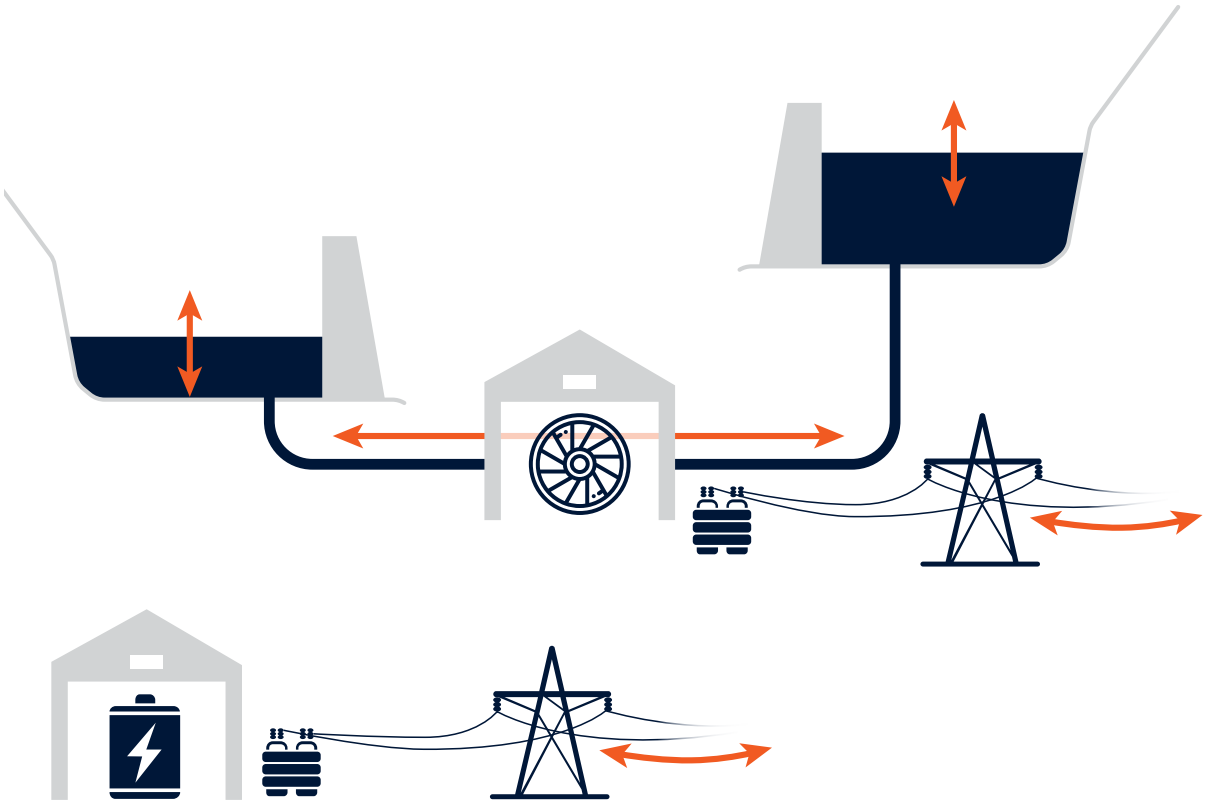


Figure 1: Energy storage and supply for frequency control.

ENERGY STORAGE FOR SMART GRIDS

A smart grid is a grid which uses control and communication in a specific way to avoid the need for costly expansions of the existing cable or line infrastructure. However, if the control of distributed power generators does not produce the desired figures or if, for example, voltage tolerances are exceeded, or transformers are overloaded, an energy storage system may be of use. It stores excess energy and can thus prevent the need to shut down a distributed power generator (or, at least, delay such an eventuality). This type of energy storage can be used for optimizing self-supply, storing energy peaks, ensuring a household can run off-grid, and providing back-up voltage in a sensitive supply area.

BATTERY STORAGE SYSTEMS FOR THE INDEPENDENT START-UP OF POWER PLANTS

If a power plant is able to run what is known as a black start, this means that it can start itself up independently and supply energy in the event of a blackout. To achieve this, reliable energy storage systems need to be in place in order to run the auxiliary power units for start-up – so that a compressed air supply or oil lubrication is available, for example. The energy in this case comes from conventional lead batteries, which supply the auxiliary power units with direct current. In contrast, power plants that cannot run black starts need energy from the grid in order to restore the plant to operation.

BATTERIES AS STABILIZERS FOR RENEWABLES

Energy from the sun and wind naturally fluctuates widely, potentially creating a huge balancing problem for the electricity grid. For example, if the wind suddenly drops or a cloud blots out the sun, the amount of power generated will change. Conversely, a boost in the infeed caused by the wind picking up may cause the line frequency to increase. If this happens too quickly, the primary balancing system is often unable to compensate for it and the secondary balancing is too slow.

For this reason, the immediate rise or drop of power output experienced in wind or solar installations is dampened by batteries. If the wind picks up or solar radiation increases, energy generation rises rapidly and this excess energy is used to charge a battery. This reduces the steep rise in output, giving the primary and secondary balancing systems enough time and capacity to compensate for any further rise. On the other hand, if the wind or solar radiation drop abruptly, the battery compensates for the fall in output by feeding power into the grid. These battery storage systems can be in effect for a matter of minutes to several hours.

LONG-TERM STORAGE: SEASONAL SHIFT

Alongside the short-term storage of power-generation peaks, demand is growing for systems which can conserve energy for longer periods of time. One term that is currently trending in this context is "seasonal shift," which refers to the storage of energy over several months. "Power-to-gas" or "power-to-liquid" technology is used for this. It converts electrical energy into hydrogen and subsequently into gas. For example, gas is generated in the summer with energy from solar installations and used in the winter for heating or for power generation using gas turbines. These systems are less efficient than batteries, but over such long time periods batteries would have naturally discharged. Lithium-ion batteries, for example, lose up to 30% of their stored capacity every month as they lose charge.

BATTERY STORAGE: THE SOLUTION OF THE FUTURE

Batteries are highly versatile and can be used in a wide range of applications. Particularly given our changing approach to energy sources, batteries have an indispensable role to play because the large-scale output fluctuations that renewable energies are subject to can be balanced using batteries. However, the technology is not (yet) fully matured or cost-effective, and this prevents it from being rolled out universally. State financial assistance and investment married with proactive regulation are required to help make the transition, as has happened in South Korea. In recent years, some five billion dollars have been invested by the Korean government in projects relating to battery-based energy storage systems. As a result, these systems are now being incorporated into the planning of every new-build project and retrofitted in public building development projects throughout the country.

JÜRGEN RESCH,
INDUSTRY MANAGER
ENERGY & INFRASTRUCTURE

ENERGY STORAGE SYSTEMS AT A GLANCE

A few examples of energy storage systems used today:

Thermal energy storage systems

- Hot water tanks
- District heat storage systems
- Steam accumulators
- Firebricks

Chemical energy storage systems

- Batteries
- Rechargeable batteries
- Hydrogen storage systems

Mechanical storage systems

- Pumped-storage power plants
- Compressed air reservoirs
- Flywheels
- Spring accumulators

Electrical storage systems

- Capacitors

Other energy-storage systems such as wind-gas, solar-gas, or thermochemical systems are currently in development, testing, or pilot stages, but are not yet in large-scale use.

ZENON SUCCESS STORY

THE BEST TECHNOLOGY FOR A RENEWABLES PROJECT

zenon Controls the Energy Storage System at Jeju Sangmyeong Wind Power Plant

The Korean island of Jeju is no stranger to leading-edge energy technology after being selected, in 2009, as the location of a Smart Grid test-bed that would underpin the Korean government's ambitious Smart Grid infrastructure plans. When Korea Midland Power Co. Ltd (KOMIPO) created a new wind power plant and energy storage facility on the island, it looked to COPA-DATA partner NEOPIS for an equally revolutionary solution based on the energy automation software zenon.

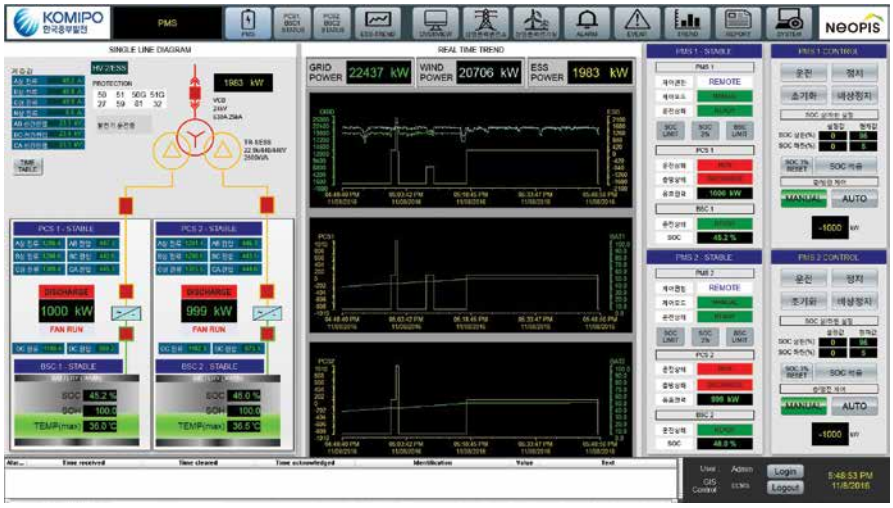


Figure 1: The Power Management System overview screen displays real-time status and trend information of different devices, e.g. charging and discharging of the batteries.

KOMIPO is a subsidiary of the Korea Electric Power Corp. and is one of five public power suppliers in Korea. It operates thermal and renewable energy power plants across Korea and, in 2015, began work on a new 21MW wind power plant consisting of seven wind turbines on the Korean island of Jeju.

Project architects for the new Jeju Sangmyeong wind farm were aware that, as with any renewables project, fluctuations in supply – that don't necessarily match fluctuations in demand – can cause problems in the planning and delivery of a reliable electricity supply.

In order to tackle this problem head-on, the new wind power plant was designed to include an Energy Storage System (ESS) equipped with a high-performance lithium-ion cell technology Battery Management System (BMS) developed by LG Chem specifically to support the stabilization of power supply in renewables operations.

The scope of the project, therefore, included the need for a secure and reliable Electrical Equipment Control and Monitoring System (ECMS) and a Power Management System (PMS) which would be able to visualize and control the electrical equipment and also connect to the Energy Storage System. It was vital that the new software system would be flexible enough to fulfill the requirements of all included subsystems – and deliver highly reliable redundancy between the ECMS & PMS primary server and the ECMS & PMS secondary server to underwrite the security of supply.

KOMIPO undertook a rigorous tender process to identify a solution that would meet the utilities' needs. Jun Seon Lee, the Project Manager at KOMIPO with responsibility for the Jeju Sangmyeong wind power plant project, explains: "We were convinced by the bid submitted by the NEOPIS team because of their expertise in our sector. NEOPIS is the leader in the field of renewables control and management here in Korea. We felt confident the NEOPIS team would be able to deliver a high-quality solution and implementation."

PARTNERING UP FOR UNIQUE RENEWABLE PROJECTS

As well as offering system integration for substations, traditional power plants, and renewable energy plants, NEOPIS produces its own range of hardware designed for use in the energy sector, including power protection panels, protection relays, etc., and has been a member of the COPA-DATA Partner Community since 2014.

Hyeon Hui Choe, Manager at NEOPIS, explains why his team selected COPA-DATA's zenon automation software for use in the Jeju Sangmyeong wind power plant: "We know zenon has a proven track record in the energy industry and supports crucial communication protocols such as IEC 61850, IEC 60870, and IEC 61400-25. zenon is also a highly flexible solution that would enable us to meet the stringent requirements for both elements of this control and management solution and deliver the redundancy needed."

The seven wind turbines are controlled using the ECMS based on zenon and using the IEC 61850 protocol – a typical substation automation application that provides secure and effective local control.

COST-EFFECTIVE ENERGY STORAGE CONTROL

The Power Management System (PMS), the software that controls the ESS, was also implemented by NEOPIS using

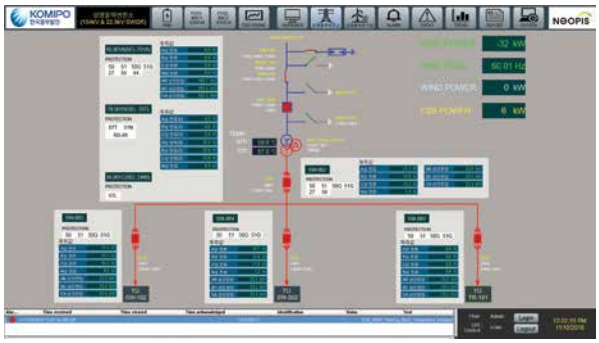


Figure 2: This single line diagram gives a comprehensive overview of the high (154kV) and low (22.9kV) voltage grid network and switchgears, including detailed transformer information.

Figure 3: Single line diagrams such as this low voltage switchgear screen display vital information in a clear and visual way.

zenon. zenon displays and provides control over how much energy is stored in the batteries and how much is transferred directly to the grid. Rules can be set in the system to define when energy is stored.

This includes, for example, relative cost; during the night energy is cheaper because of limited demand and so, to optimize profitability, energy is sold back when it can achieve the best price. zenon offers the flexibility to automate these processes in the PMS or the operator can adapt them to meet current circumstances manually.

The IEC 61131-3 programming interface zenon Logic has been an integral component of zenon for many years and provides automation engineers with considerable benefits. zenon and zenon Logic access a shared database, and shared variables and data types can be created, amended, or deleted by either system. NEOPIS has programmed unique functions within zenon Logic to address the specific requirements of this renewables project – which have much potential for energy suppliers such as KOMIPO.

Hyeon Hui Choe at NEOPIS explains: "zenon Logic provides extremely reliable control while being a far more cost-effective solution than any other viable alternative. What's most exciting for us is that zenon can fulfill many roles on one physical device: soft PLC, HMI, database server, and data analysis – all backed up by flexible and rapidly configurable out-of-the-box redundancy options. This makes zenon now our first choice for projects of this kind."

"zenon is now our first choice for projects of this kind."

HYEON HUI CHOE,
MANAGER AT NEOPIS

Project Manager Jun Seon Lee states: "zenon has proven to be a highly intuitive system for the control and operation of the plant. It has enabled us to automate the processes around energy storage in such a way that we can optimize revenue generation. We are really pleased with the performance and operation of the system. In zenon, we have a single solution for control and monitoring of both the wind farm and the energy storage operations with built-in redundancy that would allow operation even in the event of a system blackout occurring."

AN INTEGRATED SOLUTION

Another key advantage of zenon, which convinced NEOPIS it was the best solution for the job, is its integrated zenon Logic, which serves as a Soft PLC.

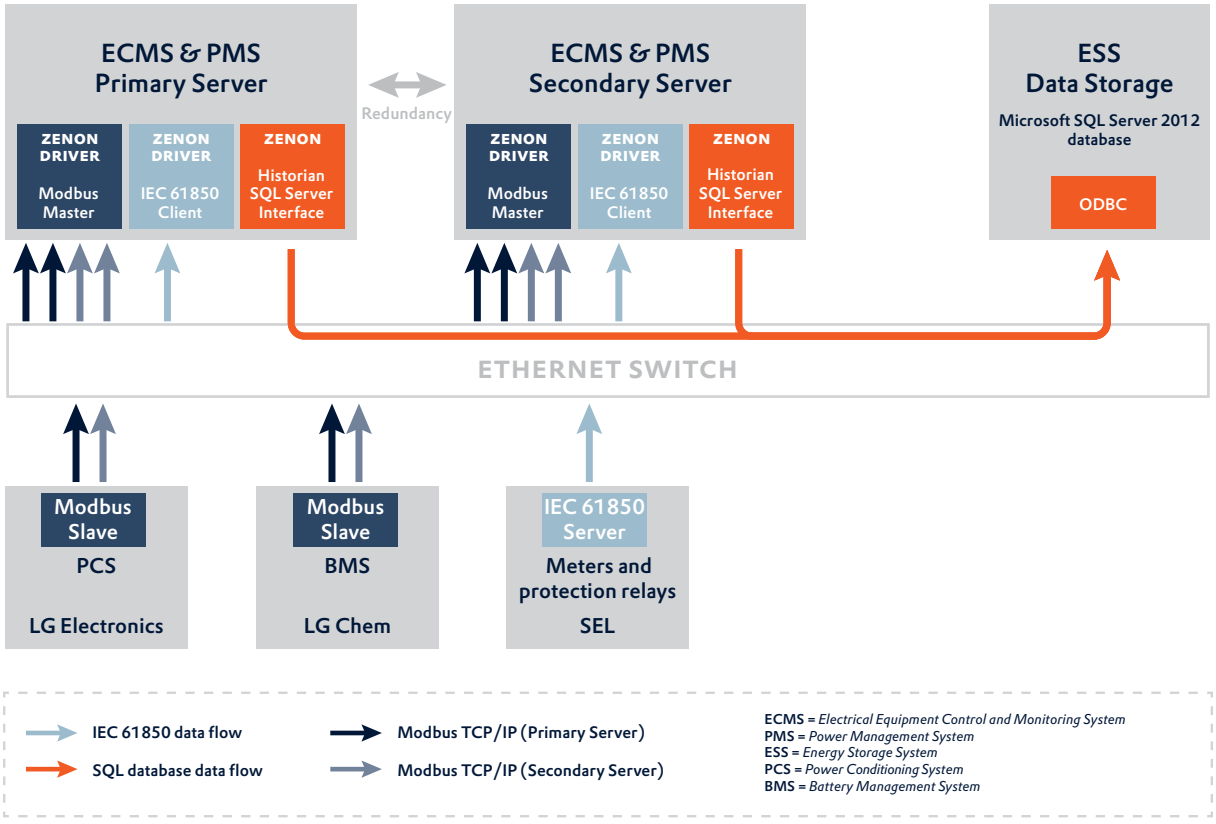


Figure 4: Network diagram of ECMS & PMS, including system components, data flow, and redundancy.

HIGHLIGHTS:

- IEC 61850-compliant Electrical Equipment Control and Monitoring System (ECMS)
- Flexible Power Management System (PMS) for control and monitoring of energy storage
- Rapidly configurable built-in redundancy
- Integrated IEC 61131-3-conforming Soft PLC (zenon Logic)
- Unique combination of Soft PLC, SCADA, HMI, database server, and data analysis in a single system

CONTACT:

YoungSu Kim
Technical Sales General Manager
COPA-DATA Korea
youngsu.kim@copadata.com

EFFICIENCY THROUGH ERGONOMIC DESIGN
OF PRODUCTION PROCESSES

THE CHANGING FACE OF AUTOMOTIVE PRODUCTION

"Any customer can have a car painted any color that he wants so long as it is black," Henry Ford is famously quoted as saying in the early era of automotive mass production. It's a thought that still raises a smile, but the fact is that today's buyers demand a wide range of models to choose from as well as customization options. This has consequences for the way in which production lines are organized and the software solutions required to facilitate them. Powerful visualization systems help staff to maintain a view of the bigger picture in production and logistics applications.

As product portfolios grow, conventional manufacturing processes – and limited production space – are no longer able to accommodate them. Automotive manufacturers therefore rely on flexible production and capacity management in order to manage model diversity and guarantee the customer individualized production. The industry also faces the challenge of minimizing tied-up capital by dispensing with interim storage as much as possible.

SIAMESE TWINS: LEAN PRODUCTION AND TRANSPARENT SUPPLY CHAINS

In 2013, a case study by the Fraunhofer Institute on the topic of Industry 4.0 and smart factories predicted an increasingly intensive shift toward lean production in automotive manufacturing. This has certainly come to pass: today, automotive manufacturers around the world make cars according to lean production principles. A lean, flexible approach is the only way for these companies to maintain their competitiveness.

The goal of lean production is to eliminate all areas of waste from production processes while also increasing efficiency and effectiveness in manufacturing. In basic terms, the lean production principle calls for production to be strongly aligned with customer demand. The aim is to only produce what customers require and to do so at the point in time when they need the product. To boost production efficiency, stocks of material are reduced to the absolute minimum and interim storage is restricted as much as possible. Meanwhile, resources must enable the shortest possible throughput times in order to increase production effectiveness.

With this kind of production, the manufacturer is able to respond to customer requirements quickly and flexibly and, at the same time, maintain a high number of variant models in low batch sizes. In this context, lean production is based on the "just in time" (JIT) manufacturing principle. Primarily, the system relies on a transparent supply chain: purchasing, logistics, and manufacturing must be tightly meshed together so that the required raw materials are provided to the production stage at the right time.

JUST-IN-TIME: DEMAND-BASED ASSEMBLY AND MANUFACTURING

According to the JIT principle, the product is produced in line with customer requirements without time, materials, or staff resources being wasted. The idea is that this reduces inventories and capital tied up in inventory and means that materials and products no longer have to be produced in advance in large volumes, but instead assembly and manufacturing are conducted on demand in a flexible manner. This shortens lead times, saves on warehouse space, and reduces storage costs in the medium term. In order to keep producing goods reliably, cheaply, and quickly just in time, centrally managed optimization is dropped in favor of distributed coordination.

PRODUCTS WITH LOTS OF VARIANT MODELS REQUIRE A SHIFT IN PRODUCTION APPROACH

The challenges facing automotive manufacturers today are short production cycles, maximum diversity of variants, outstanding productivity, and flexible utilization. However, as the variety of models available keeps growing rapidly, the strengths of the JIT production method can no longer be harnessed to its full potential. Maintaining the principle of JIT production would require even more complex manufacturing systems. In addition, the very high levels of product variance make a separate interim storage space and part store necessary for each model in the production line, taking up immense volumes of production space in conflict with the JIT principles of minimizing stock, space, and resources. It would fly in the face of the advantages and strengths that the JIT concept has to offer.

To solve this dilemma, manufacturers have enhanced the JIT concept further, developing the just-in-sequence (JIS) principle – also known as the "pearl chain" process.

JUST-IN-SEQUENCE: A FOCUS ON PRODUCTION-SYNCHRONIZED AVAILABILITY OF ALL PARTS

Faced with such a variety of models and variants, body construction is moving away from single-type production and into sequential production instead. As a production-synchronized procedure, JIS represents a refined just-in-time concept.

In body construction, it is common for a production plant (sink) to require resources from several other production lines (sources). As a result, the sources must coordinate their sequential production arrangements among themselves so that the sink is given the right components at the right time, in line with the first-in-first-out (FIFO) principle of manufacturing.

Members of staff in production also benefit from the advantages of the JIS principle: all the parts needed for each work step are provided in the correct order, and there are no areas that are prone to error.

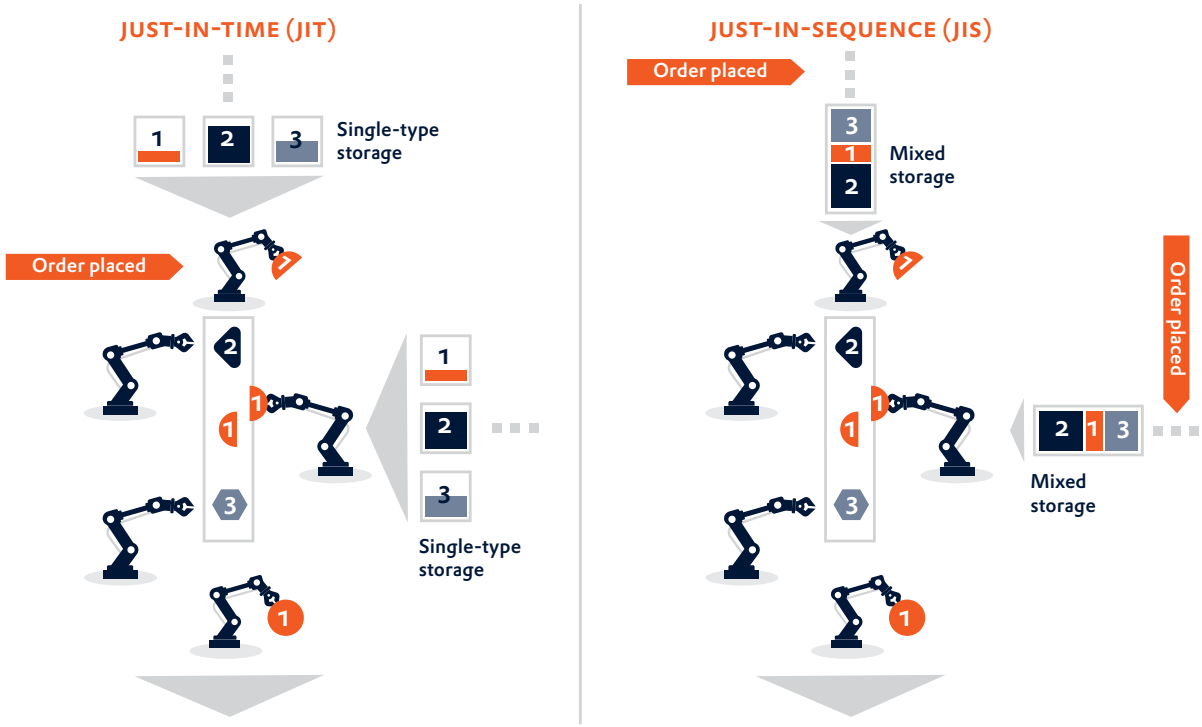


Figure 1: The difference between JIT and JIS operation lies mostly in the production sequence specification, which shifts from the end of the production chain to the beginning.

COMMUNICATION AS A SUCCESS FACTOR

Above all else, there must be good communication between the various partners in the supply chain, and the information provided must be valid and easily accessible. If this is not the case, this could result in an unstable material flow that prevents successful manufacturing and, in a worst-case scenario, leads to production being halted. To avoid this, as a check of last resort, the human factor can be incorporated into the automated system. Ultimately, experts in production and production logistics must decentralize decision-making power. For this purpose, they require the right information being provided at the right time.

So what's the best way of explaining the complexity of this process to users? And how do we make it easier for them to follow? These questions have been around since the birth of the first computer and are an integral part of human-machine communication, as well as other interdisciplinary sciences. As machines and their day-to-day use have modernized, these are questions that have given rise to a new scientific discipline: ergonomics.

ERGONOMIC DATA PROCESSING

From an ergonomic point of view, it is important to provide a user-oriented communication interface for processing data and displaying information.

The data should be filtered and processed by the production system, meaning that the user receives only essential and relevant information. The advantages of this are that no unnecessary information can sway the decisions that a user makes and the user is given a better overview of the process. The filtered information must be displayed

in a way that allows the user to interpret and analyze information effortlessly and unambiguously. With this goal in mind, visualizations provide a much faster overview of complex matters than text-based descriptions permit.

ZENON PROVIDES AN OVERVIEW OF PRODUCTION

Another key consideration in the sequential production process is the availability of data and information. These must be accessible at all times – and everywhere – so that users can respond more quickly to unexpected events, for example, during production.

In particular, web technologies and mobile devices, such as smartphones or tablets, allow flexible access to communication with machines and provide new possibilities of handling data, thus making it easier for users to grasp complex issues.

A further opportunity presented by Industry 4.0 is the networking of buildings, control systems, and sensors with production systems to create an IoT world that incorporates data and services. This allows the availability of real-time information relating to production processes to reach unparalleled levels of quality. As a result, data modeling is increasingly able to reflect the current state of affairs and production processes become more transparent as a whole.

zenon is a system that enables ergonomic and modern visualization, abstract data processing and constant transfer, uninterrupted availability of data, and accessibility across a variety of devices.

CONCLUSION

In the past, the ergonomic aspects of visualization and the processing of data received very little attention. In industrial production, graphical interfaces were usually designed quickly and without much consideration since the complexity of the processes was relatively limited and the focus was firmly on the ability of the system to run. In the future, however, a focus on ergonomics will be unavoidable due to the changing nature and increasing complexity of production environments. An increasing focus on customers and their demands for individuality in products will be essential to maintain competitiveness. And, as things stand, this means that there will be no end in sight to the increasing complexity of production environments. The subsequent necessary consideration of ergonomics marks a further step toward Industry 4.0.

HIGHLIGHTS:

- The increasing variety of automotive models and the wide variety of individual features that are available pose particular challenges for manufacturers.
- By harnessing lean production and the lean, flexible processes associated with it, manufacturers can remain competitive.
- Lean production is based on the just-in-time method.
- However, the wide variety of models and variants is pushing just-in-time production to its limits.
- The just-in-sequence principle, which is based on the production-synchronized availability of all required parts, offers a solution to this.
- The availability of all relevant data and ergonomic ways of visually presenting it are essential factors when implementing the just-in-sequence principle successfully.
- zenon ensures transparency for automotive production based on the just-in-sequence approach.
- zenon ergonomically displays the required data on diverse end devices.

DOMINIK HELLINGER,
TECHNICAL EXCELLENCE AUTOMOTIVE

OFF THE RECORD:

THE TRUTH ABOUT DATA INTEGRITY IN PHARMA

The Food and Drug Administration (FDA) has long emphasized the importance of reliable data in pharmaceutical manufacturing. Despite this clear recommendation, recent FDA reports have highlighted an increase in data integrity violations during several recent current Good Manufacturing Practice (cGMP) inspections.

In simple terms, cGMP states that pharmaceutical manufacturers should follow instructions and document actions correctly. This way, if any deviation occurs in the product, the company can investigate it and put measures in place so that the same error does not happen again. This guarantees the repeatability and safety of the product being manufactured and protects the brand.

Data integrity refers to the completeness, consistency, and accuracy of data, which needs to be attributable and legible. Data integrity violations can lead to warning letters and even fines. More importantly, drugs approved on the back of inaccurate data could pose a threat to patients' lives. For all these reasons and more, data integrity is at the heart of the pharmaceutical records discussion.

AUDIT TRAILS

The pharmaceutical industry has been slowly transitioning from manual paper records to automated, electronic records. Batch records predominantly take an electronic form today, but other systems, including production processes

such as start-ups, changeovers, running documentation, and sampling, are not always digitalized. Although paper records can work well for some companies, they leave more room for human error and data manipulation than their electronic counterparts.

The true benefits of digital records become obvious when companies use reliable automation software to automatically record the actions each user carries out. The software also makes data manipulation impossible; once a user inputs data, the action is saved automatically. If the input is outside acceptable parameters, the system records the error and the user is required to leave a comment in order to continue with production.

Another advantage of using HMI software for electronic recordkeeping is that it can be set to ensure the user can't start or finish a batch without completing a required set of information. This means there will be no more gaps in the records, which in turn improves data accuracy.

Finally, automation software can automatically log any critical event and allows users to set alarms or notifications should any of the predefined values be outside set parameters. This ensures that any deviation in the process is identified in real time, automatically shared with relevant members of staff, and recorded for the audit trails.

THE LOGIN DILEMMA

The best way to ensure precise data integrity is to assign individual logins on a per-user basis. There are several ways of achieving this. One common method is to assign each operator an individual username and password. Other secure, reliable methods could be using Active Directory logins or personal fob cards with a scannable bar code. With individual user login enabled, the system can record any action or change made by an operator, thus offering a clear picture of the overall process.

Individual logins also increase a system's security, potentially at no additional cost, because they allow a company to attribute different authorization levels to users.

DATA SAFETY

Another common concern of pharma companies is data safety: how does a manufacturer know its production data is safe and complete?

By using reliable automation software, companies can help eliminate this issue. When exporting archives to an external database, for example, the software uses its internal mechanisms to check whether the data has been correctly and completely transferred. If the transfer fails for some reason, the software will automatically resend the transfer next time it starts a cycle, so data is never lost or corrupted. The software will also log the incident chronologically in the events list.

To ensure data safety, the software stores critical data such as audit trails and alarm lists in binary files – which are illegible to the human eye – in a proprietary format. Authorized users can modify data within the software, but the modification will always be logged in the audit trail. This practice ensures the archive is accessible, easy to read, and accurate for authorized users, while also adding an additional layer of protection against unauthorized access.

The benefits of using electronic records in pharmaceutical manufacturing go beyond regulatory compliance. Looking to the future, companies who strive for continuous improvement can use electronic records to achieve this business goal.

Digital records that guarantee data integrity and safety allow companies to breeze through regulatory compliance and focus on improving and growing their business, comfortably complying with the FDA CFR 21 part 11, annex 11 and cGMP.

LEE SULLIVAN,
REGIONAL MANAGER SOUTH UK

AROUND THE WORLD

WHO IS WHO

Andreas Grün

SPECIAL SOLUTIONS DEVELOPER

COPA-DATA HEADQUARTERS

AT COPA-DATA SINCE: 2012
RESPONSIBILITIES: As a special solutions developer, I take care of special and individual customer requirements. This means, for example, developing wizards and services that are used by the zenon programming interfaces. My tasks also include creating proof of concepts and supporting customers with the implementation of pilot projects.
I GET MY INSPIRATION FROM ... trips, music, and – when it comes to tackling challenges – the valuable advice that I get from my colleagues.
IT IS MY DREAM TO ... explore all of the fascinating places in the world with my wife.

You can reach me at:
andreas.gruen@copadata.com

Ursula Kramarczyk

TECHNICAL PRODUCT MANAGER

COPA-DATA HEADQUARTERS

AT COPA-DATA SINCE: 2008
RESPONSIBILITIES: IEC 61850, IEC 60870, ICCP, Command Processing, Automatic Line Coloring.
I GET MY INSPIRATION FROM ... my friends and from meditation.
IT IS MY DREAM TO ... hmm, I'm probably too happy where I am to think much about that. Plus, be careful what you wish for; you might get it ALL.

You can reach me at:
ursulak@copadata.com

Francisco Ortiz Muñoz

SALES BANAGER

COPA-DATA IBÉRICA, BARCELONA

AT COPA-DATA SINCE: 2017
RESPONSIBILITIES: I am responsible for developing COPA-DATA business in Spain and Portugal. As an all-rounder, I perform many tasks to achieve this objective – from lead generation to customer visits, demonstrations, and negotiations. Key to this is the development of our local Partner Community and generally raising awareness of the goodies that zenon has to offer to the world!
I GET MY INSPIRATION FROM ... passionate individuals who break established limits and take things to the next level. And surely there is nothing purer than the smile of a baby.
IT IS MY DREAM TO ... keep on running, try new things out, and never stop learning. As Reinhold Niebuhr said, "Change is the essence of life; be willing to surrender what you are for what you could become." Great!

You can reach me at:
francisco.ortiz@copadata.com

WHO IS WHO

Emrah Mehmedovic

TECHNICAL CONSULTANT

COPA-DATA CEE/ME

AT COPA-DATA SINCE: 2016
RESPONSIBILITIES: I work in Technical Consulting. I try to present solutions to customers' problems and support them with their projects via phone or email. I also run zenon training sessions and workshops. On top of this, I support our sales team.
I GET MY INSPIRATION FROM ... my family and friends. They motivate me every day and give me the drive I need. To clear my head, I love running and taking part in other sports.
IT IS MY DREAM TO ... be able to drop everything and travel the whole world someday. There are so many countries with hugely varied cultures that I want to explore in more depth one day.

You can reach me at:
emrah.mehmedovic@copadata.com

Garrett Miller

SALES MANAGER

COPA-DATA US

AT COPA-DATA SINCE: 2016
RESPONSIBILITIES: I oversee all sales efforts for the North America region. I work closely with engineers and project managers in the automation industry, helping them to identify project needs and determine the most effective software solution for their use case.
I GET MY INSPIRATION FROM ... exceeding customer expectations.
IT IS MY DREAM TO ... be successful at COPA-DATA and contribute to our further growth in the North American market.

You can reach me at:
garrett.miller@copadata.com

Dominik Hellinger

TECHNICAL EXCELLENCE AUTOMOTIVE

COPA-DATA GERMANY (OTTOBRUNN)

AT COPA-DATA SINCE: 2017
RESPONSIBILITIES: My remit includes the development of general concepts, architectures, methods, templates, and automation mechanisms in the automotive industry. For example, I co-managed the "zag for Phoenix controllers" project for AUDI Ingolstadt. As a team, we integrated the local VASS standard for conveyor technology into zenon and created a wizard that automatically generates zenon projects after successful configuration. In addition, I work on proof of concepts, pilot projects, and customer-specific showcases; for example, new modules – such as the smart checklist and operator guidance – or MES functions that are designed and demonstrated for customers' applications.
I GET MY INSPIRATION FROM ... music.
IT IS MY DREAM TO ... win at Monopoly just one time.

You can reach me at:
dominik.hellinger@copadata.de

YOUR ZENON SALES REPRESENTATIVE
IN JAPAN

LINX R&D Corporation

Kei Murakami, CEO of LINX, (left) and Stefan Reuther, CSO of COPA-DATA, make the new partnership official with a handshake at COPA-DATA's headquarters in Salzburg, Austria.

In 1990, LINX Group was founded in Yokohama, Japan. Since then, we have established three offices: in Yokohama, Nagoya, and Osaka. We are now a leading distributor of the world's most advanced machine vision and automation products aimed at the Japanese market. Over many years, we have developed world-class expertise in machine vision, real-time control, PLC/motion, and a number of different software development tools. Our 90 employees work together with 25 partner companies across Japan. Our operations span South East Asia, Singapore, and Malaysia.

"Our entire sales and technical staff possess highly-skilled engineering backgrounds and experience, as well as a deep understanding of the technologies utilized. The depth of our expertise uniquely positions our company to provide unparalleled services to our customers," says Kei Murakami, CEO of LINX.

Education is an important part of our leadership role. Technical training is conducted every month, ensuring that expertise is communicated quickly to project-leading partner companies. At the annual LINX Days event, more than 1,000 participants from our customers and partner companies can learn about the latest developments in industrial automation. We see great potential for zenon in industrial fields including Factory Automation, Food & Beverage, Life Sciences, Automotive, and Energy.

For us, it is important that COPA-DATA is an independent company and that zenon has an excellent reputation in the market. From our very first contact with COPA-DATA in 2017 we have met a very well organized team. We have enjoyed a great start to our cooperation. We have already begun initial pilot projects with zenon and are excited about the upcoming opportunities for our alliance.

You can reach us at:

LINX R&D CORPORATION
1-13-11. eda-nishi, Aoba-ku
Yokohama 225-0014
Japan
tel: +81-45 979 0734
fax: +81-45 979 0732
e-mail: info@linx.jp
web: www.linx.jp

DID YOU KNOW THAT ...

… Japan is the third largest economy in the world?

… Japan is made up of 6,852 islands?

COPA-DATA Partner Community

JOHANNES PETROWISCH,
HEAD OF CORPORATE PARTNERSHIPS

Professional Services as the Basis for Best-in-Class Solutions

The ongoing digital revolution is putting businesses and organizations in both the public and private sectors under growing pressure. Existing infrastructures need to be optimized and work processes automated to the maximum possible extent, making them more efficient. On top of all this, there is a demand for lower costs and greater competitiveness. In this context, tailored solutions that deliver value creation as quickly as possible are gaining an increasingly high profile. We are meeting these challenges on the market through our range of professional services. These include architecture and implementation consulting, as well as the creation of templates and pilot projects. For end users with a global presence in particular, they provide the best possible solution for their individual, complex circumstances. However, COPA-DATA clearly differentiates its own services from conventional project businesses through its worldwide network of over 220 certified COPA-DATA partners. They continue to play a crucial role in system integration during the actual implementation or roll-out.

PROFESSIONAL SERVICES FOR BEST-IN-CLASS SOLUTIONS

The introduction of professional services at COPA-DATA represents a commitment to pass on our expertise to end users and partners by providing them with best-in-class solutions. As part of this, we are directly sharing our expertise as the manufacturer of zenon. For our end users, this means gaining access to the best possible zenon applications. Our partners benefit from intensive knowledge-sharing in the course of customer interaction and from enhanced project business. Our professional services will be available throughout the entire COPA-DATA sales network in order to ensure worldwide coverage. In short, end users benefit from the expertise of the manufacturer when creating a solution and from a certified partner landscape when rolling it out worldwide.

ONLY THE BEST SOLUTION IS GOOD ENOUGH

COPA-DATA wants to set new benchmarks through pioneering technology and vertical solution expertise. In order to achieve this, it is vitally important that we are as close as possible to our end users and the challenges they face. The introduction of professional services represents a further step on the road towards this objective. Through our services, we are delivering not only maximum quality in the zenon application – in terms of user-friendliness, navigation concepts, and a secure architecture, for example – but also a full spectrum of options from the zenon software platform. This allows our end users to be more flexible and means they are investing in something that is future-proof.

Another positive aspect of our services is the ability to share knowledge with the end user. Through direct consultations, the customer is kept fully aware of what is happening and can actively participate in shaping processes. This knowledge transfer reduces the number of potential blind spots to a minimum. When implementing a project on an international scale, the end user can rely on the integration expertise of the worldwide COPA-DATA partner landscape.

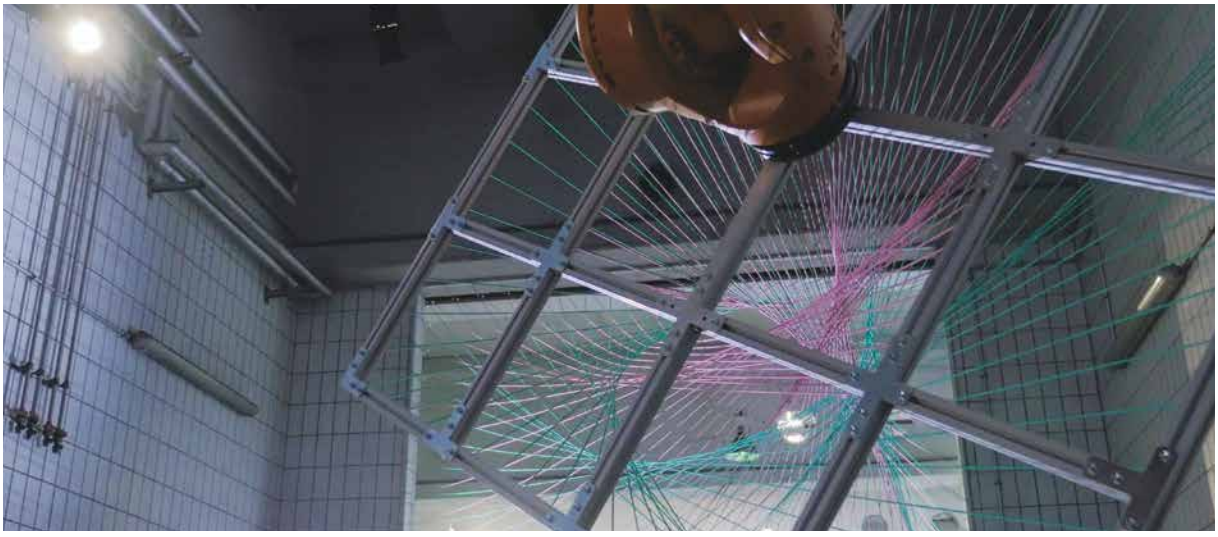
MORE PROJECTS, MORE EXPERTISE

The message we are giving to the more than 220 members of the COPA-DATA Partner Community is clear: COPA-DATA's professional services open up new business opportunities, especially for cross-location customer projects that require a local integration service in the course of a roll-out. COPA-DATA does not have a competitive relationship with its partners. In fact, quite the opposite is true: with its professional services, COPA-DATA has laid the foundations for new and exciting customer projects executed by its partners.

Interview with Industrial Designer Emanuel Gollob

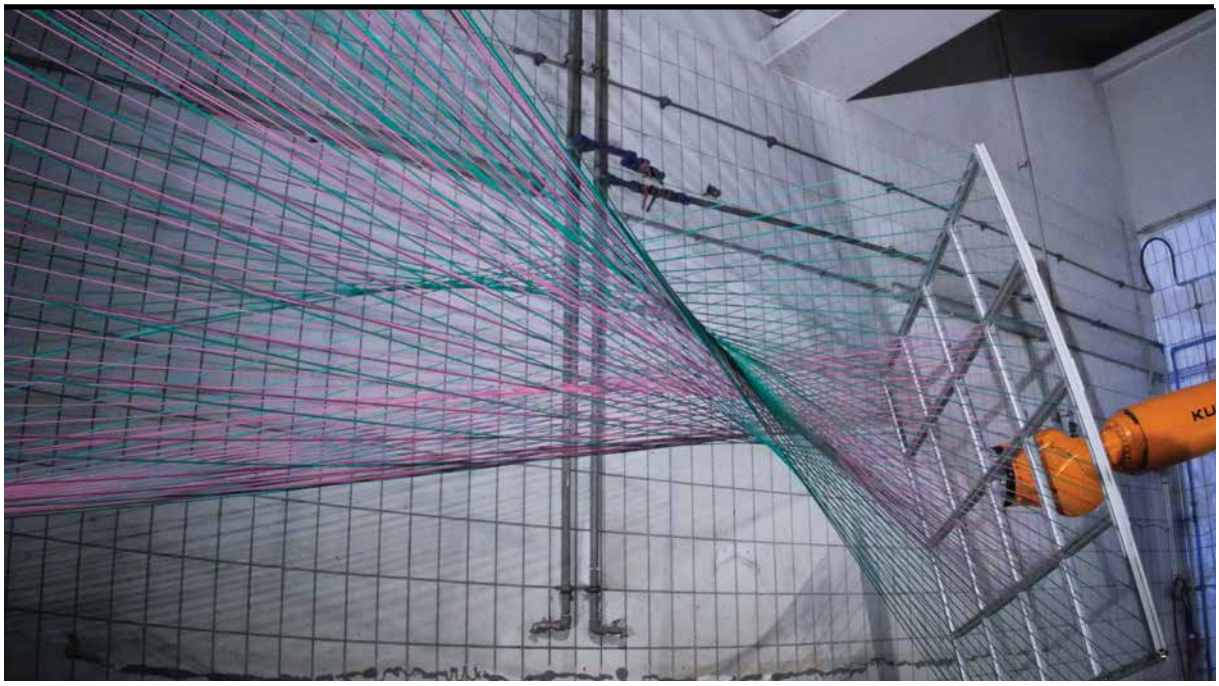
Wonderfully Absurd, Perplexing, and Inspiring

DEALING WITH DIGITALIZATION AND WHY WE CAN NO LONGER ACCEPT SIMPLY DOING NOTHING



zenon is participating in a very special project that flies the flag for inactivity. Sounds absurd? Well, it is – but deliberately so. In his media art project entitled "Robot, Doing Nothing," industrial designer Emanuel Gollob uses modern technology to make us aware – in a positively perplexing and socio-critical way – that we have practically unlearned the state of inactivity.

Up until now, a project like this was unknown territory for us and zenon – and that's what made it all the more interesting. Emanuel Gollob proved how well art, technology, and industrial design could work together in an inspiring installation at the Ars Electronica Festival 2017 in Linz, Austria, where he exhibited "Robot, Doing Nothing" in impressive fashion. Our curiosity was piqued: we wanted to know how the project came about and what it is designed to trigger in observers. We invited Gollob to take part in an interview so we could find out.



How would you describe your work? Where is your artistic focus?

I would say that I have a passion for performance. The essence of movement, interaction, and endlessness plays a key role in all of my work. For me, it's not all about the end product – the process is equally important, as is the knowledge that the players, people, and structures involved in the process exchange between themselves.

A key element of my work is the use of technological innovations. I often use these in a way which is both perplexing and other than intended. I want to do more than simply criticize or glorify technological progress – my aim is also to see and use it as a tool to shape our future lives.

I work at the interface between art, technology, and society, creating insights into speculative future scenarios based on current developments.

What prompted you to create media art projects involving industry partners?

I strongly believe that taking an interdisciplinary approach to projects can only bring benefits. Ideally, projects should capture observers exactly where they already are. The more diverse the approaches collaborating partners take when implementing the projects, the easier it is for individual observers to find a captivating entry point.

What's more, industry partners provide technological innovations and knowledge in specialist fields of application, which can be difficult for artists to access. In most cases, observers do not yet have a fixed understanding of what innovations of this kind mean, so this opens up an opportunity for the project to influence the connotations associated with innovation.

Another thing that I find exciting about collaborating with industry is that it creates a reciprocal effect: industrial companies are confronted with outside-the-box ideas, while artists encounter in-depth knowledge of a subject that is alien to them.

I do not believe that my projects only achieve their objectives once they are complete and being exhibited. Instead, I see them as speculative future scenarios that become real in the course of the process through the involvement of several partners.

What was your motivation and source of inspiration for the "Robot, Doing Nothing" project?

I realized that I was no longer able to simply sit there when I was at a bus stop – I had to be scrolling through my smartphone, even though I wasn't taking in what was on the screen. This was my trigger for starting to research the effects that our interaction with digitalization has on our ability to do nothing. Various studies see doing nothing as a key foundation for developing empathy, our ability to interpret, and creativity. And those are the very characteristics that we want to possess as reflective individuals in a post-industrial era with artificial intelligence (AI).

I want to live in a society where technological progress is used for the good of people and not purely for the sake of progress.

OUR INTERVIEWEE:

EMANUEL GOLLOB

Emanuel Gollob (*1991) is a freelance industrial designer who lives in Vienna. Since 2012, he has studied Industrial Design at the University of Applied Arts, Vienna, where he was also employed as a Research Assistant in the Robotic Woodcraft program in 2016 and 2017. His most recent projects include a smartphone video selfie station in the Austria Pavilion at EXPO 2017 in Astana, Kazakhstan, as well as the "Robot, Doing Nothing" media art project, which was exhibited in the ARS Electronica Center and at the ARS Electronica Festival in Linz in 2017.

www.emanuelgollob.com
Twitter: @emanuel_gollob

Figure 1: The zenon application shows both a 3D visualization of the robot and also important movement data, such as axis values or load data.

What message do you want to convey with the "Robot, Doing Nothing" project?

In "Robot, Doing Nothing," our lost acceptance of inactivity is a central theme, as is the pro-societal approach towards technological progress. Directly linked to this is the question of what kind of future society we want to strive for. Is unconditional meritocracy, with all its positive and negative implications, the type of society that we want to develop?

What's more, the way in which people identify themselves through work and other development possibilities in a post-industrial era is a key consideration in "Robot, Doing Nothing."

It is wonderfully absurd that in "Robot, Doing Nothing," the robot – the very symbol of efficiency, with *robota* coming from the Slavic for *work* – is faced with the human and tries to help them to do nothing.

Looking into the future, where is your artistic journey heading?

Together with Magdalena Mayer, a psychologist specializing in aesthetic research, I am currently working on a continuation of "Robot, Doing Nothing." We want to build on the latest neuroscientific findings and combine these with aesthetic research, brain-computer interface (BCI) and electroencephalography (EEG) systems, and robotics.

Under the working title "Doing Nothing with AI," together with partners from the scientific community and industry, we want to develop audiovisual AI as a form of neuro-reactive support. Using the EEG data from users, we hope to generate audiovisual stimulations from the installation based on parameters and refine them using an evolutionary approach and feedback algorithms.

Our aim is to capture users in their high-tech worlds and give them the opportunity to relearn how to do nothing and be offline for a moment.

THIS INTERVIEW WAS CONDUCTED BY
JULIA ANGERER, CORPORATE COMMUNICATIONS MANAGER
AT COPA-DATA

ABOUT "ROBOT, DOING NOTHING"

The project was realized with KUKA industrial robots at the Center for Creative Robotics (Prof. Johannes Braumann) at the University of Art and Design Linz in conjunction with sound artist Michael Schweiger (sonification: University of Art and Design Linz Sound Laboratory) and media artist Chris Noelle (live visuals: www.metofa.com).

ARTISTIC CONCEPT

The "Robot, Doing Nothing" project accuses modern society of being incessantly busy, even beyond the confines of everyday life in the workplace. What's now demanded of us – primarily due to the proliferation of digital technologies – is our permanent presence, readiness to communicate, and receptivity to information. In response, Emanuel Gollob has created a **fictitious scenario**: the results of studies demonstrate that the efficiency of our society is enhanced by doing nothing. Based on these studies, Austria's Ministry for Digital and Economic Affairs decides to remunerate members of the country's workforce for their inactivity with a minimum wage. To encourage people to get started as professional idlers, robotic installations are provided for citizens in public spaces, whereby observing the constant changes in the machinery's form is meant to facilitate the transition into a meditative state of indolence. In this relaxed frame of mind and body, it is possible to focus on one's self and open up to sweet stasis.

"Robot, Doing Nothing" was developed by Emanuel Gollob together with Johannes Braumann and is based on studies that show that people benefit from improved concentration, empathy, and creativity when spending time actively doing nothing. Gollob conceives of a post-industrial future where robots are already part of several aspects in our daily life. At this time, the conscious activity of doing nothing is encouraged by meditative robotic installations in public spaces.

TECHNICAL CONCEPT

The installation is made up of an industrial robot (KR 210 R3100 from the KUKA QUANTEC ultra series), a SICK laser scanner, a 49" monitor, and our zenon software. A plate with cords is attached to the robot arm and the other ends of the cords are fixed statically in the room. If a visitor enters the laser field of the scanner, the robot orients itself toward them and the cords – which are in the spotlight – thus creating complex geometric patterns. The KUKA robot arm is controlled in real time with the KUKA mxAutomation interface and can therefore respond directly to the audience. zenon combines the data from the laser scanner with the data from the robot and visualizes this for visitors on the large monitor. The zenon application shows both a 3D visualization of the robot and also important movement data, such as axis values or load data. By scanning the QR code provided, visitors reach a web-based zenon application, which has been made accessible globally via the Microsoft Azure cloud platform. "Robot, Doing Nothing" is therefore more than just an aesthetic, kinetic sculpture – it also demonstrates many aspects of Industry 4.0 and the Internet of Things, a development toward more flexible production and more intuitive handling of complex machines.

Video:
Impressions of the "Robot, Doing Nothing" media art project
Scan & Play!

https://youtu.be/WsfJjzSs-8c

DOORBELL TO DOOR LIGHT – PRACTICAL PROBLEMS SOLVED FOR INDIVIDUAL NEEDS

ZENON IN THE HOME

A Visit to the Home Workbench of a zenon Expert

PHOTOGRAPHY:
FLORIAN MITTERER PHOTOGRAPHY

We all know that zenon helps to make intelligent infrastructure and smart buildings a reality. But what about a home networked using zenon? How does that work in practice? Markus Wintersteller – Technical Product Manager and one of our longstanding employees in Salzburg – has used zenon in his house since 2007. We took a look around the home that he shares with his wife and three children.

Hello Markus! Thank you for letting us take a look around your home and at the sophisticated technical architecture you have created. What inspired you to start using zenon at home?
I got the idea when we extended our house in 2007 – I had been at COPA-DATA for five years and zenon had made a real impression on me. At the time, it seemed totally logical for me to install a control system – and, ideally, that had to be zenon. Back then, the only things on the market in this area were gadgets and, for a long time, these couldn't provide the same functions, setting options, and reliability as zenon. An old friend of mine from electrical college had installed a similar system at the time, but without an HMI, as the programming would have been too complex for him. As a zenon specialist, it was easy for me.

So, was it crucial to have an HMI that could be directly configured with zenon?
Definitely. The fact that straton can run directly on a WAGO controller was just as important. That made a lot of things easier for me because I could then carry out the central PLC programming in the environment that was familiar to me.

And what was the main reason for deploying zenon as a building control system?
My wife was the driving force behind me installing a building control system. She is deaf and, even before we renovated our house, we were using a relay control that converted the doorbell into a flashing light. This function is very important for my wife, as it means that her attention is drawn to guests at the door. I wanted to retain this and improve it even further. However, there was no solution that was sophisticated enough on the market at the time.

And that's where zenon came into play?
Exactly. Now, when the doorbell rings, the light flashes at the same time. Using zenon, I can now control which light flashes where and at what time. And at nighttime the doorbell doesn't ring at all in our house and only some lamps are active. Nothing flashes in our bedroom or the children's rooms at night, because we want to sleep. These additional functions made it important to use zenon as a user interface, as it meant that I could configure the necessary logic behind it.

You have been using zenon in your home for over 10 years. How many updates have you carried out since then?
I started with zenon 6.20. Whenever I had time, I carried out updates. These were always associated with new functions that I introduced, particularly with straton. In most cases, our circumstances – especially those involving our three children – or improvements to features that I wanted to adapt to our life in the house dictated which updates I made. I was really pleasantly surprised when I replaced the WAGO controller with the latest model. I now get a cycle time of 2 ms, rather than the previous 100 ms. All I had to do was replace the CPU, adjust the controller in the project, let the offsets recalculate automatically, install the program, and in a matter of minutes, I was back online. It was really easy.

To what extent have the children influenced the control system?
That's quite funny. In 2007, our second daughter was born. Later, our two daughters shared a room and when the older one got up in the night, she naturally switched the light on in the room. That woke the younger one up, of course, and she was suitably bad-tempered the next day. I switched things around so that, if someone pressed the light switch in the children's room at night, the light in the bedroom wouldn't come on, but the light in the corridor or the toilet would instead. As expected, the children then wouldn't switch the bathroom or corridor light off, so I also installed a timer to save energy.

Markus Wintersteller configures his zenon project, which is connected to the central WAGO control system.

The youngest Winterstellers also have fun using a tablet for handling the intuitive house visualization.

The awning installed later did not need a new switch thanks to zenon. A practical switch combination controls it now.

And did that always work seamlessly?
I was able set it up without any problems to start with, but I still had a few things to learn. For example, in this specific case, I had actually installed a deadlock, which ultimately meant that the light couldn't be switched on at night at all. So we then ended up with screaming in the dark, which was just as much of a problem!

So the building control system was designed from a parenting and behavioral point of view?
Yes, it is adaptive technology. Today, you could probably apply artificial intelligence to it. In zenon, all automatic rules can be switched to manual control – but only with an unlocking code. For us, that's a kind of child lock. The children have also operated zenon intuitively themselves in the past. Now, they prefer to use the switches and their combinations. Using the Chronological Event List (CEL) in zenon, I have also been able to prove, on several occasions, that the light has been left on in certain rooms. Now, zenon checks automatically at certain times and switches the light off.

Are there any items that are completely controlled by zenon here in your home?
All the lights and blinds are combined into one system. We can control them using zenon, via a smartphone or a tablet in the house, but mainly using the wall switches in the room. However, I did not have a switch for every light or every blind – certain functions could only be controlled using zenon. As a result, I introduced changes to the switch functions in the logic. Now, if you press the top and bottom wall switches at the same time, a configured action occurs. This saves the need for extra switches – it means that our awning, which we installed after the switches were in place, can be moved out and in again without me having to install a new switch.

Very practical. In addition to less drilling and cabling, what are the benefits for you?
We benefit from this hidden home technology on a daily basis. The switch combinations are, of course, not obvious and my wife only realized recently – to her astonishment – that you can move all of the blinds down at the same time. Our most-used function is definitely the ability to switch off all the lights in the house from a central point. Outside the house, I measure the wind speed with a small wind wheel, the brightness with a light sensor, and the temperature inside the conservatory. If the wind is too strong, the blinds and the awning retract. If the conservatory gets too warm in the summer, zenon takes care of shade. The brightness sensor calculates the length of the day and zenon sets the house to day or night mode with the corresponding configurations.

How can zenon help with security in the home?
That's essentially a question of what stage the technology is at. For example, we can activate a combination for an emergency situation all over the house. This switches on all the lights in the house at the same time. All external plug sockets can only be activated using zenon and are switched off again once a configured time has elapsed. In every case, zenon offers even more options to increase security in the home. These include presence simulation or the detection of conspicuous patterns of movement from the data from motion detectors. You could also install an alarm system in conjunction with it.

What are the next potential configurations?
There are still a few things missing. I'd like to install a rain sensor and an outdoor temperature sensor – I'll get around to it sometime soon. I also like the idea of an energy data management system combined with the PV system, and maybe even link this to smart meters.

Finally, what do you think of the much-hyped topic of the moment – voice control?
I'm still somewhat skeptical, particularly about the extent to which the technology will survive over the long term. I do want to try it out. It appeals to me from a technological point of view, but it still poses major security issues, of course. I am trying something out in this area, but I'm not using familiar female names like the major manufacturers are. I'm simply using the phrase: "Hey zenon, turn the light on!"

Sounds exciting! Keep us up to date and have fun developing your home project further.

THIS INTERVIEW WAS CONDUCTED BY
SEBASTIAN BÄSKEN,
PUBLIC RELATIONS CONSULTANT
AT COPA-DATA

zenon Software Platform

Scalability | Robustness | Security | Performance | Flexibility | Openness | Validation
Ergonomics | Lifecycle Management | Interdisciplinary Nature