IU INFORMATION UNLIMITED

THE COPA-DATA MAGAZINE #45|2026 EN

SPOTLIGHT

Shortage of skilled workers

EDITORIAL

Much has already been said about the skills shortage – and for good reason: It's a major challenge for companies around the world. The shortage of skilled workers poses risks to productivity, growth, and innovation – and thus to our prosperity. In short, it affects all of our futures.

That is why we have dedicated the 45th issue of Information Unlimited to this topic. We examine the diverse impacts of the skills shortage from a wide range of perspectives. We also explore potential solutions, including continuing education, artificial intelligence, international recruiting, digitalization and automation. Read more in the article "Easing the skills shortage" starting on page 8.

Then discover what senior energy sector and industry executives think about the issue in our survey (page 14). And did you know that the skills shortage has been a problem for centuries? Scientists Stefan Huber and Simon Hoher explain (page 16). Plus, we take a look at how the zenon software platform can help to alleviate some of the pressure (page 18).

Lifelong learning is very important to us as a company. On pages 58–60, we discuss why skills are essential for success. In our sustainability column, on page 40, two education experts, Meike Wiemann-Hügler and Isabelle Hau, discuss how to "relearn learning". Sometimes, however, information simply needs to be easier to find. On page 33, we prompt you to use our zenon Engineering Assistant to find all the answers about using zenon that you need.

Join us as we dive into diverse solutions to address the shortage of skilled workers. If you have additional ideas or feedback, our editorial team would love to hear from you at iu@copadata.com.

I hope you find this issue informative.

Thomas Punzenberger

THOMAS PUNZENBERGER
CEO

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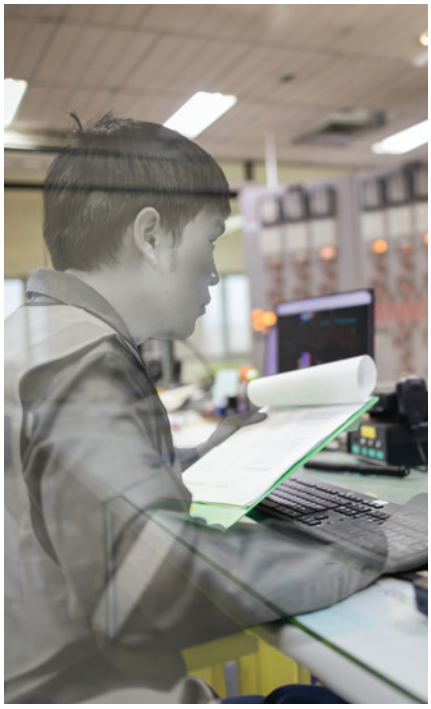
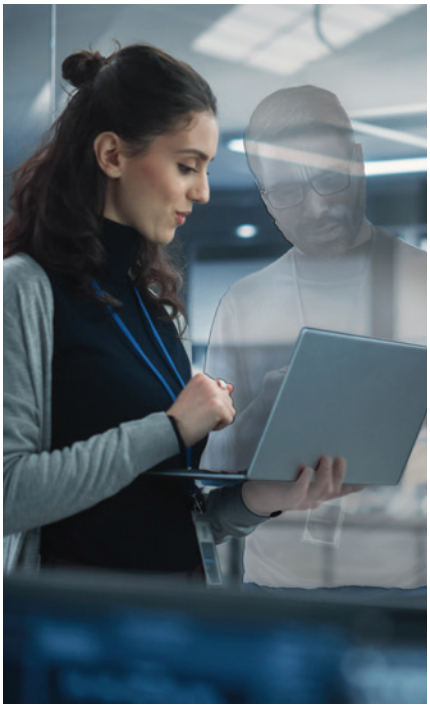


SPOTLIGHT

SHORTAGE OF
SKILLED WORKERS

PRODUCTS & SERVICES



INDUSTRIES & SOLUTIONS

AROUND THE WORLD

SPOTLIGHT

SHORTAGE OF SKILLED WORKERS

EASING THE SKILLS SHORTAGE

The shortage of skilled workers is a global problem. This challenge can be met through internal training, making the workplace more attractive, automation, artificial intelligence, and recruiting internationally. Thomas Ofner of Netz Niederösterreich GmbH and Andreas Langer of ControlTech Engineering AG discuss the impact on the energy and manufacturing sectors in our featured interviews.

AUTHOR: CHRISTIAN GRANBACHER-ROTH, FREELANCE JOURNALIST IN SALZBURG

The shortage of skilled workers is a major challenge for companies. In addition to affecting many industrialized nations, it is also increasingly impacting emerging economies. According to a 2025 study by ManpowerGroup, around 74 percent of companies worldwide are struggling to fill vacancies.

ORIGINS OF THE SHORTAGE

There are several reasons for the shortage of skilled workers. Birth rates are falling across the globe, while life expectancy is rising. "Austria is clearly following this trend, with the number of people in the workforce in our country expected to decrease by around 261,000 by 2040," says Rolf Gleissner, Head of the Department of Social and Health Policy at the Austrian Federal Economic Chamber (WKÖ). The retirement of the baby boomers further exacerbates the deficit, as there are fewer young people entering the workforce than older people leaving it. Gleissner states, "This pattern affects almost all developed economies."

Additionally, desired working hours deviate significantly from economic reality. Companies prefer full-

time employees, while the part-time employment rate is steadily increasing. People are working less per capita than before the Covid-19 pandemic, as the demands of business versus individual working time preferences are diverging.

Besides the fact that certain positions are difficult to fill, there is another problem. If staff can be found, they do not always have the desired level of training. Gleissner explains, "The qualifications of many job seekers are increasingly less aligned with the requirements for a digitalized and environmentally transformed economy."

SHORTAGE OF SKILLED WORKERS VARIES IN SEVERITY

The problem of the shortage of skilled workers varies depending on the nation. An aging population and low birth rates are exacerbating the shortage of skilled workers in certain countries. "Japan and many European industrialized countries are particularly affected, primarily due to demographic developments," says Christoph Schneider, Senior Counsellor for Economic Policy at the Federation of Austrian Industries (IV). "The US is also experiencing significant shortages in technical professions."

According to Schneider, countries with a younger population structure or active skilled immigration, such as Canada or parts of Southeast Asia, are less burdened by demographics. "However, increasing skills gaps are also becoming apparent there, particularly in high-tech and industrial professions," adds Schneider. "In the long term, the economies that will have an advantage are those strengthening technology training early on, strategically managing skilled migration, and increasing labor force participation in broad segments of the population."

Schneider points out that the global competition for talent has already begun. Those countries that create attractive framework conditions will be successful. This requires performance-oriented education systems, international openness, reliable planning security for companies, and a clear social appreciation of technical and industrial professions. "The shortage of skilled workers is not a temporary economic issue, but a structural challenge of our time," Schneider warns. "Those who do not take decisive countermeasures now risk tomorrow's innovation, growth, and prosperity."

FOCUS ON HIGH-QUALITY TRAINING

Walter Haas, Managing Director of Innovation Salzburg GmbH, confirms that demographic trends vary considerably worldwide. Haas directs an agency sponsored by the state of Salzburg that promotes innovation and business in the region, connecting companies, startups, and research institutions and supporting the implementation of future projects.

Haas acknowledges the different challenges faced by industrialized nations with low birth rates combined with an aging society and regions with high birth rates and many young people, including countries in Africa, parts of Asia, and South America. However, he emphasizes, "The question of education and the qualification of skilled workers is always absolutely essential." Only with high-quality training can the skilled worker shortage ultimately be addressed. Haas says, "While education systems are developing in these countries, they are often still insufficient." In addition, many forecasts indicate that countries currently on a high birth-rate trajectory will eventually follow the demographic trend we see now in western countries. India and Brazil, for example, which currently have a comparatively young population, are expected to see slowing birth rates.

WALTER HAAS, MANAGING DIRECTOR AT INNOVATION SALZBURG

With regard to the skills shortage, countries are relying on a variety of innovative solutions. Scandinavian countries are certainly pioneers with good experiences in promoting the compatibility of family and career. This has increased the employment rate of women. Canada is known for a successful immigration system that attracts skilled workers in a very selective way. And many countries and regions have launched initiatives to attract talent alongside their focus on education and training. Often, companies and regions join forces to attract skilled workers.

The competition between locations for skilled workers is already extremely fierce. In light of overall developments, there is a clear trend to address the skills shortage through technology. Artificial intelligence and robotics will take over more work and automation activities. At first, this will mainly involve routine, highly standardizable work activities. Look at Japan, for example, and you will find that humanoid robots are playing an increasingly important role. In many production halls, robots and humans are already working together side by side.

And what about industrialized nations? Haas says, "Experts predict, for example, declining birth rates in Italy, Germany, China, and Japan in the coming decades, which will lead to an even greater decline in population." This can be seen quite clearly in key forecast data. For example, according to OECD figures for South Korea in 2000, there were 8.7 young people for every older person. Haas points out, "According to projections, by 2050 there will be only 1.4, which is less than is predicted for Germany."

DON'T LOSE THE CONNECTION

If the economic recovery comes, the need for skilled workers will intensify. The international battle for talent will step up, as the example of Austria shows. Austria no longer competes regionally, but globally. Whether we can maintain our position as an attractive location will be decided in this decade. Without reforms to work incentives and without successful skills-based immigration, a permanent slowdown in growth is imminent. Rolf Gleissner warns, "Only sufficiently qualified professionals will enable a sustainable economic recovery."

Gleissner also believes that policymakers bear a responsibility in this matter. He supports tax incentives for longer working hours and overtime. At the same time, migrants need to be integrated in the domestic labor market much faster and more efficiently. "The shortage of skilled workers is a structural, ongoing phenomenon," emphasizes Gleissner. Countries like Germany and Scandinavia are investing heavily in skilled worker initiatives. Austria must actively engage in this competition. Gleissner adds, "It is important to create a welcoming climate for skilled workers alongside clearly defined qualification requirements." That certainly applies to other countries as well.

> "The shortage of skilled workers is not a temporary economic issue, but our era's structural challenge. Those who do not take decisive steps today risk tomorrow's innovation, growth, and prosperity."
>
> Christoph Schneider, Senior Counsellor for Economic Policy, The Federation of Austrian Industries (IV)

MEASURES TO ADDRESS THE SKILLS SHORTAGE

- It is essential to have a grow-your-own strategy. This includes both training for junior staff and professional development for existing employees.
- Position your company as an attractive employer: To attract skilled workers, companies should offer measures to improve job satisfaction, flexible working hours, career models, and work-life balance.
- According to Walter Haas, Managing Director of Innovation Salzburg, women represent an important potential that must be better utilized to meet the skills shortage, especially in the form of flexible working models and childcare solutions.
- Automation is considered one of the key solutions to meet the shortage of skilled workers. COPA-DATA is contributing to greater efficiency in business through its zenon software platform and the opportunities zenon offers for standardization, for example in production facilities.
- International recruitment is another option. In Austria, for example, the Austrian Federal Economic Chamber's International Skilled Workers Initiative (IFO) supports companies to recruit qualified specialists from focus countries such as the Philippines, Brazil, and Mexico. The aim is to reduce administrative hurdles (e.g. Austria's Red-White-Red visa for highly qualified workers), improve international matching, and strengthen Austria's position as a place to work in the global competition for talent.
- Another effective approach can be regional enterprise hubs in areas with potential for a skilled workforce.

“OUR EMPLOYEES HAVE TO BE READY TO IMPLEMENT THINGS”

Thomas Ofner is team leader for the remote control of complex systems at Netz Niederösterreich GmbH. In this interview, he explains how automation in industry can improve efficiency and why it is important to find the right specialists who are capable of thinking outside the box.

Information Unlimited: To what extent is Netz Niederösterreich GmbH affected by the shortage of skilled workers?

Thomas Ofner: We do business in many different sectors and the skills shortage impacts these sectors differently. First, it is challenging to attract the right employees. Second, existing employees must have reliable access to the skills they actually need in their everyday work. Sometimes there is a gap between the training material and what is actually needed in practice.

Do you mean there is too little practical application?

Not necessarily. The challenge is often to logically link and accurately combine information. For example, an individual may excel in their field, but the tasks often require a broader perspective – an ability to think outside the box.

Are there also positions that cannot be filled with qualified professionals at all?

It is rare that we cannot find anyone at all. A bigger challenge is the question of whether new employees will be able to meet the requirements over the long term. Some start with initial difficulties and develop into highly qualified team members. In some areas, we work with standard market tools but remote operation involves highly specialized engineering. These tools are learned over time – there is no standardized training for them. As a result, these profiles are not available off the shelf.

But you need to have the right basic training and be willing to learn a lot of new things?

Exactly. For example, one of our applicants stated openly from the beginning that she was not an engineer. She had even had to drop out of college. However, she had completed an apprenticeship in mechatronics. So, we gave her a chance. Today, she is one of our brightest employees. A university degree is not absolutely necessary. What is more important is how they approach the topic and their willingness to take responsibility and implement things consistently.

THOMAS OFNER
NETZ NIEDERÖSTERREICH GMBH

Thomas Ofner is team leader for the remote control of complex systems at Netz Niederösterreich GmbH (Netz NÖ), a central and wholly owned subsidiary of EVN AG. It is responsible for the operation, expansion, and maintenance of electricity and gas grids in large parts of Lower Austria. Like all network operators, it faces the challenge of meeting the growing demand for electricity with flexible networks and delivering energy exactly when it is needed. Through its partnership with COPA-DATA and use of zenon, Netz NÖ is able to meet operational requirements, security specifications, and scalability needs at the same time, strengthening the reliability of supply over the long term.

It is said that automation will help companies meet the skills shortage. What is your experience with COPA-DATA and the zenon software platform?

They have been very good. COPA-DATA is a reliable partner. With zenon, we are able to visualize processes

in every substation. For example, switch positions, measured currents and voltages, as well as hazards and operating messages are clearly displayed. Colleagues who react to downtime, for example, use these visualizations during inspections and maintenance. This allows them to work more efficiently and fix problems faster.

Despite the support from zenon, would you say that specialists also need the ability to link information?

Yes. A substation contains approximately 50 kilometers of copper cables and a range of devices – therefore downtime is possible. When such events occur, someone attends and uses visualization to pinpoint the problem. The application provides multiple texts and additional information on the topic. In many cases, zenon leads directly to the cause. If the situation is more complex, it remains the task of human experts to combine the information and develop a viable solution.

How important is automation in your sector?

It is essential for balancing out fluctuations in grid supply and ensuring flexibility. The sheer volume of data means it would be virtually impossible for humans to process on their own. Ideally, experts use the transparency created by automation to delve deeper into the highly specialized topics in order to find effective solutions.

AUTOMATED ENGINEERING PROMOTES EFFICIENCY

What can companies do to address the skills shortage? And to what extent does automation improve performance in manufacturing? Andreas Langer, COO of ControlTech Engineering AG (CTE), answers these and other questions in the interview below.

Information Unlimited: How greatly is CTE affected by the skills shortage and what are your options for improving this situation?

Andreas Langer: A few years ago, we had real trouble finding qualified staff. The situation is better now, partly because we have taken steps to meet the challenge. Our own training program has been significantly strengthened and we employ several apprentices and working students, as well as employees who are pursuing further training alongside their work. You could say we're training our own skilled workers. We maintain close ties with universities of applied sciences nearby. For example, students who wrote their bachelor's or master's theses while at our company were able to prove themselves, they got to know us, and upon graduation they stayed with the company. If you are not well-known in the media, these contacts with educational institutions can be helpful. Fellow students, relatives, and acquaintances also apply, as they learn about our company through these contacts.

What is the situation in your sector with regard to the skills shortage?

For us, as a company in the automation and IT sector, it is currently somewhat easier to find skilled workers because the sectors we serve are suffering less from economic problems than others. The life sciences and critical infrastructure sectors are currently in high demand. We also occasionally receive applications from workers who have experience in the machinery and automotive industries. Skilled workers seeking new challenges often bring a wealth of experience and can provide new energy.

Your customers are also affected by the skills shortage. What benefits does automation technology offer these customers?

There are two key aspects when it comes to speaking about the benefits of automation in this context. First, it is important to consider the level of system automation implemented. Second, one should also consider the automated engineering used to develop and integrate systems. COPA-DATA's zenon software platform, as an automation system, greatly helps end customers to design system orchestrations and process flows extremely efficiently. The second aspect is the time it takes to develop solutions. Time-to-market is an important factor and can be positively influenced in software engineering through the right form of automation. We work closely with COPA-DATA to continuously improve zenon in

both aspects in order to increase the overall efficiency even further. The conscious use of artificial intelligence will offer even more opportunities and possibilities on both sides.

What specific improvements in workload will these automation steps make?

As an application, zenon can control and monitor defined processes. This allows the customer's production workers to focus on non-conformances, such as system messages or alarms, directly and in a dedicated way. During the remaining time, they can carry out other activities, which improves efficiency further. We have been using zenon for about 15 years and have been able to reduce workloads on customers and skilled workers. As long as no errors occur, the work process runs smoothly. And, if there are deviations from the ideal process, the automation systems help by generating reports and analyzing these exceptions, which reduces the labor required even further.

As a system integrator, CTE needs to communicate closely with end customers and also with COPA-DATA. How do these processes work?

We get a lot of feedback from customers and discuss it regularly with the responsible parties at COPA-DATA. We work with multiple systems and multiple clients. All the experiences gained from this work help us to continuously improve the systems. We are currently working on a large project with a major pharmaceutical client. In such flagship projects, we are more than just a middleman. We coordinate at the customer site with colleagues from COPA-DATA and the end customer, and all three parties work together to achieve the best possible results in engineering and systems. In short, we all work together to develop the product in the right direction. It is a good partnership and it has borne a lot of fruit already.

ANDREAS LANGER
CONTROLTECH ENGINEERING AG (CTE)

For more than 15 years, COPA-DATA and ControlTech Engineering AG have enjoyed a partnership based on open and respectful communication. CTE is a COPA-DATA Gold Partner and provides the Salzburg-based software developer with ongoing market feedback and suggestions for product improvements.

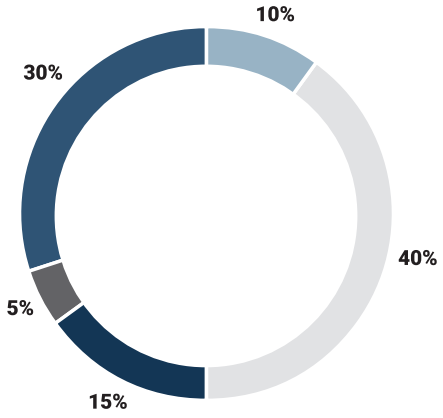
CTE and its Chief Operating Officer Andreas Langer are system integrators and deliver comprehensive solutions that include planning, implementation, configuration, and ongoing support for the zenon software platform. Consulting services and training are also provided to ensure that end customers get the most out of zenon.

SPOTLIGHT SURVEY

In autumn 2025, our major customer and partner event, zenonIZE 25, took place in our home city of Salzburg. For networking, we invited participants to St. Peter Stiftskulinarium, the oldest restaurant in Europe: In this elegant setting, executives discussed topics affecting the manufacturing and energy sectors – including the skills shortage – during the Executive Dinner. For this issue of Information Unlimited, we asked our guests to take part in our survey on the Spotlight topic.[1]

WHICH INDUSTRY DO YOU WORK IN OR WITH?

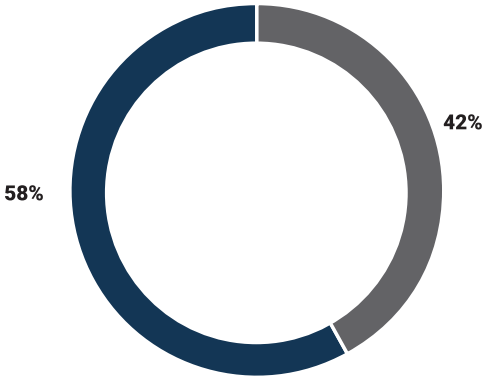
- Manufacturing – Life Sciences
- Manufacturing – Food & Beverage
- Manufacturing – Automotive
- Energy & Infrastructure
- Other



HOW SEVERE DO YOU CURRENTLY ESTIMATE THE SHORTAGE OF SKILLED WORKERS IS IN YOUR INDUSTRY?

- Very severe
- Severe
- Moderate
- Minor
- No skills shortage at all

"Very severe", "Minor" and "No skills shortage at all" were not selected as answers.

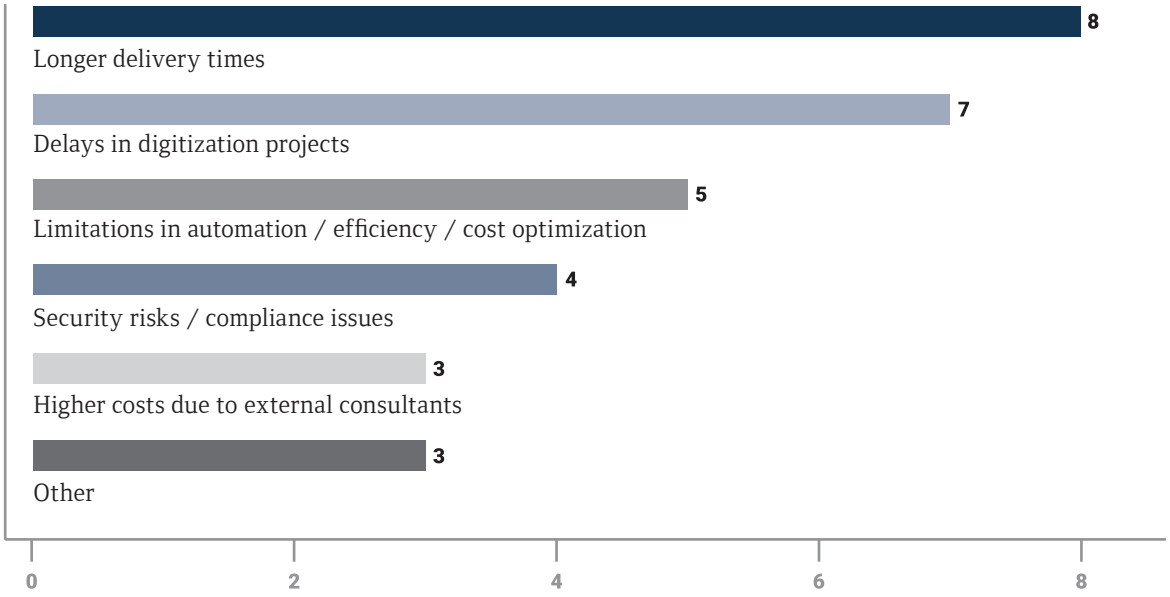


WHICH SPECIALISTS ARE PARTICULARLY LACKING IN YOUR INDUSTRY?

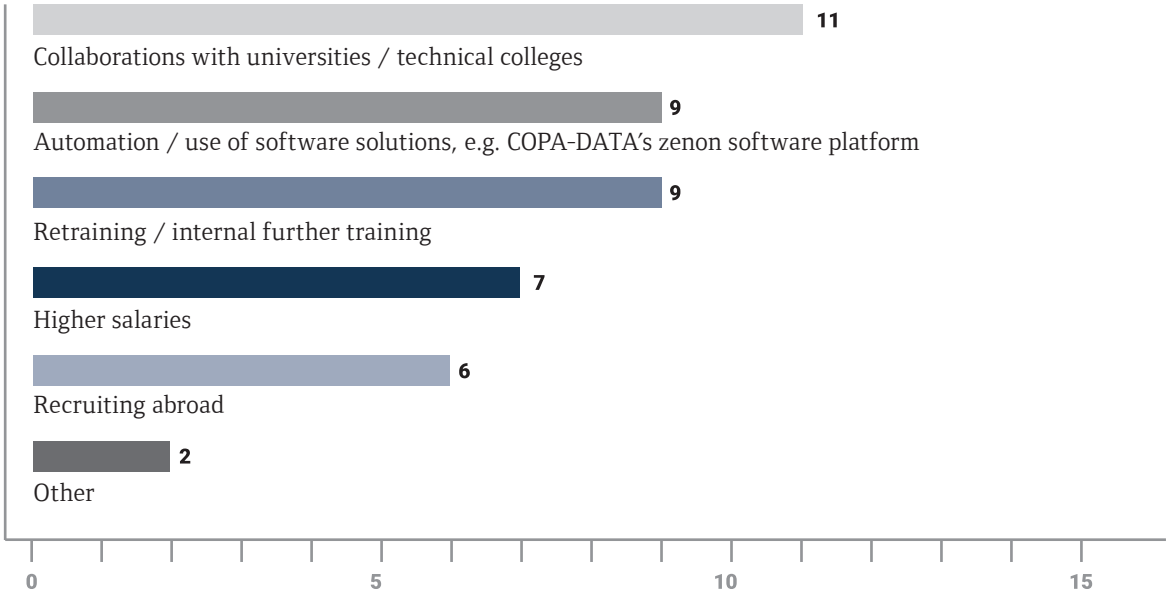
Professionals in automation and operational technology with digitalization skills and openness to change are sought after. Senior specialists, such as system architects or IT experts, are particularly needed. In the energy sector, engineers for protection systems and power supply systems are especially in demand. Other roles mentioned include electricians and electrical engineers, software developers (including machine learning and AI), cybersecurity experts, technical writers, and project managers.

[1] Participants: 12. Multiple answers were permitted for questions 1, 4 and 5. Question 3 included a free-text field.

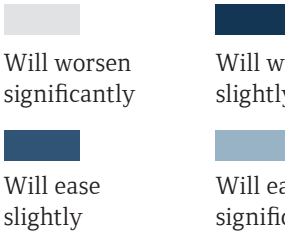
HOW DOES THE SHORTAGE OF SKILLED WORKERS AFFECT YOUR BUSINESS?

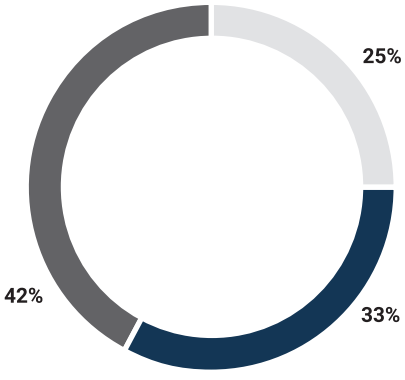


WHAT MEASURES IS YOUR COMPANY TAKING TO ADDRESS THE SHORTAGE OF SKILLED WORKERS?



HOW DO YOU EXPECT THE SHORTAGE OF SKILLED WORKERS TO DEVELOP THROUGH 2030?





"Will ease slightly" and "will ease significantly" were not selected as answers.

SKILLED WORKER SHORTAGE: OLD IDEA, NEW PERSPECTIVES

For centuries, the shortage of qualified workers has been a challenge for businesses. This challenge is becoming fiercer and more complex in light of the increasing convergence of IT and OT. But how is a skilled worker shortage actually defined? And what measures can help businesses meet the demands of the future? Here's an overview.

Labor shortages have a long history. For example, during the 1880s in Germany, there was a "people shortage" in agriculture due to the rise of industry and emigration to the US. As a solution, seasonal workers from Eastern Europe were recruited. The change in terminology over time from "people shortage" to "labor shortage" to "skilled worker shortage" reflects the significantly increasing requirements for the qualifications of workers and the growing complexity of technological fields of activity. In addition, the topic is politically sensitive and encompasses economics, industry, technology, labor, research, education, social issues, family, and migration aspects.

SKILLED WORKER SHORTAGE: A DEFINITION

What exactly are we talking about today when we discuss a skills shortage? Surprisingly, there are often no officially established definitions. At its core, however, it always refers to a lack of qualified professionals for specific fields in the labor market that limits the economic performance of companies and national economies. This raises the question of whether it refers only to academic qualifications. In addition, it is important to distinguish between a "skills shortage" (long-term, substantial) and a "skills bottleneck" (short-term, cyclical).

To assess the extent of a skills shortage, Austria, for example, still relies on statistical data on unemployment and job vacancies. A more precise analysis generally requires an improved data pool. For instance, the 2013 issue of "Spectrum," published by the Institute of Electrical and Electronics Engineers (IEEE), an international professional association, looked at figures for the science, technology, engineering, and mathematics (STEM) sector in the US. It found that, of 7.6 million STEM workers, only 3.3 million hold a STEM degree. In contrast, 11.4 million out of 15 million STEM bachelor's degree holders work outside STEM fields. However, no data is available to shed light on the reasons for this imbalance.

CAUSES AND MEASURES

Nevertheless, at least for Western industrialized countries, several common causes for the shortage of skilled workers in STEM fields can be identified. The primary reasons cited are demographic change, technological acceleration, and increasing system complexity, as well as societal changes. Political measures are needed primarily in four areas:

- **Labor force participation** – that is, the wider integration of women, older people, and migrants in the skilled labor market.
- **Education** – such as the development of new degree programs where companies, educators, and researchers work closely together.
- **Labor market** – in the form of targeted training and promotion of mobility.
- **Immigration** – targeted relief for skilled workers.[1]

[1] According to the Austrian Court of Auditor's report 12/2024

COMPLEX SOCIETAL FACTORS

Why does someone choose to study STEM subjects? This is a question that doesn't yet have a clear answer, even though the number of publications on the topic has increased significantly since 2010, particularly in the US. One thing is certain: The decision to pursue STEM subjects or not results from a complex interplay of individual, social, cultural, and structural factors. This includes self-efficacy, role models, experiences at school, and compatibility with a person's life plans.

In affluent societies, individual factors gain importance over economic aspects. The phenomenon of the gender equality paradox in STEM fields can also be understood in this context. In countries with higher gender equality, the proportion of women in STEM subjects is lower than in countries with lower equality.

A GLIMPSE INTO A POSSIBLE FUTURE

In addition, the technological diversity in computer science has increased significantly in recent decades. Software development practices have evolved significantly in terms of methodology, rigor, and the way the many tools, processes, and systems interact. This could lead to greater differentiation in computer science in the future.

When it comes to the convergence of IT and OT, these challenges become even clearer. First, OT introduces many aspects from traditional engineering disciplines, but it also significantly alters the demands placed on computer science, as demonstrated by the NIST guideline 800-82. Graduates with a general computer science background are insufficiently prepared for the intersection of IT and OT. At the same time, the field is undergoing a continuous paradigm shift. This further complicates preparation during undergraduate studies outside of research-oriented courses.

AI AS WILDCARD AND QUESTION MARK

Artificial intelligence (AI), on the other hand, shows a tendency against specialization: namely, the strengthening of solid foundations in understanding and theory that promise timelessness and appear as a necessary basis for working with AI-supported dialog systems. This requires a well-considered integration in solid programming training.

Of course, AI itself can also be considered a way to reduce complexity. There seems to be hardly any limit to its multiple promises of salvation! What we read in the guidelines of "Zen of Python," however, is truly timeless. Simple is better than complex. Complex is better than complicated.

STEFAN HUBER
Salzburg University of Applied Sciences

Stefan Huber is the Head of Research in the IT Department. He leads research activities in future-oriented IT areas and promotes scientific projects that combine technological innovations with practical relevance. His focus is on applied computer science and the interface between research, teaching, and industry.

SIMON HOHER
Salzburg University of Applied Sciences

As Head of the Master's program in Industrial Informatics & Robotics and Head of the Systems Theory & Mechatronics department in the IT department, Simon Hoher conducts research on networked technical systems, control theory, and interdisciplinary applications for Industry 4.0.

MEETING THE SKILLS SHORTAGE WITH ZENON

The shortage of skilled workers is one of the biggest challenges for businesses both in Austria and worldwide. According to Ernst & Young (EY), two-thirds of businesses consider it the number one risk to growth, and 71 percent struggle to find suitable employees. Efficient automation and smart digitalization can increase efficiency, reduce workloads for employees, and make organizations viable for the future.

The shortage of skilled workers is one of the biggest obstacles facing many businesses today. This is largely due to a structural problem. On the one hand, demographic change is causing experienced people to leave the labor market while fewer young people are entering it. On the other hand, the demand for qualifications is increasing due to technological complexity and shorter innovation cycles. The result is a "talent crunch," where supply and demand for qualified employees are drifting apart. For businesses, this poses major strategic challenges.

According to the World Economic Forum (WEF), 39 percent of businesses expect their workforce's key skills

to fundamentally change by 2030 if trends in the labor market and technology sector continue to accelerate. This is due, in no small part, to the rapid developments in artificial intelligence (AI). At the same time, only about 41 percent of businesses report that their employees currently have the skills to effectively close these skills gaps. Software platforms such as zenon from COPA-DATA make a significant contribution to strategically freeing up personnel resources and preparing them for the future of work.

TECHNOLOGY AS PART OF THE SOLUTION: DIGITALIZATION AND AUTOMATION

International analyses show that leveraging automation and digitalization is one of the most effective ways to combat the skills shortage – especially where qualified technical personnel are scarce. According to the WEF, companies worldwide expect the increased use of automation, data platforms, and digital process control to play a critical role in ensuring productivity despite a shrinking workforce. In addition, a far-reaching shift in professionally relevant core competencies is expected by 2030. This will further increase the pressure on companies to make work processes smarter.

This is precisely where the zenon software platform comes in: zenon not only automates technical processes but also specifically reduces the need for personnel to undertake repetitive, manual, and error-prone tasks. Through maximum connectivity, automatic data acquisition and processing, automated engineering, and intuitive operation, zenon stabilizes production and infrastructure operations even when experienced specialists are lacking or only available to a limited extent.

ADDRESSING THE SHORTAGE OF SKILLED WORKERS

The Economist magazine emphasizes that automation is now used less for cost reasons and increasingly as a response to structural labor shortages. Particularly in the industrial, energy, and infrastructure sectors, intelligent automation solutions make it possible to achieve constant or increasing output with fewer personnel – for example, through standardization, centralized monitoring, and data-driven optimization of complex processes.

zenon supports precisely this approach. Through centralized control centers, remote monitoring, and cross-system integration, you can monitor and control equipment, networks, or production lines with significantly fewer personnel. Specialists do not need to be permanently on site but can intervene in a targeted and event-driven manner – a critical advantage in times of scarce technical resources.

SELECTIVELY ENHANCING HUMAN LABOR

This is not about replacing human labor, but about enhancing it in a targeted way. The Harvard Business Review shows that successful automation redefines job profiles: Routine tasks are taken over by software, while employees focus more on analysis, process optimization, quality management, and technological development.

zenon has been designed and developed to minimize engineering and operating costs:

- Setting parameters instead of programming – the low-code or no-code approach significantly reduces dependence on individual specialists or knowledge keepers in the business.
- Standardization through reusable templates and intelligent objects – meaning faster rollouts and project implementations for a shorter time-to market.
- Automated engineering in project creation (learn more in the article "Have you heard of the zenon elves?" on page 24).
- Highly intuitive operating concepts across a wide range of systems and locations.

With these features, fewer specialized workers are needed to work productively with the system, while highly qualified experts can concentrate on tasks that add value. The World Economic Forum quantifies this effect: In approximately 60 percent of all jobs, at least a third of their component tasks could be automated. Platforms like zenon thus act as productivity multipliers for existing skilled workers – they compensate for skills bottlenecks without losing expertise. Automation with zenon does not mean replacing people but, rather, specifically reducing workloads for skilled workers, increasing their efficiency, and making organizations more resilient. Software becomes a strategic factor in combating the skills shortage.

HOW ZENON EASES THE SKILLS SHORTAGE AND DIRECTLY CREATES ADDED VALUE FOR COMPANIES

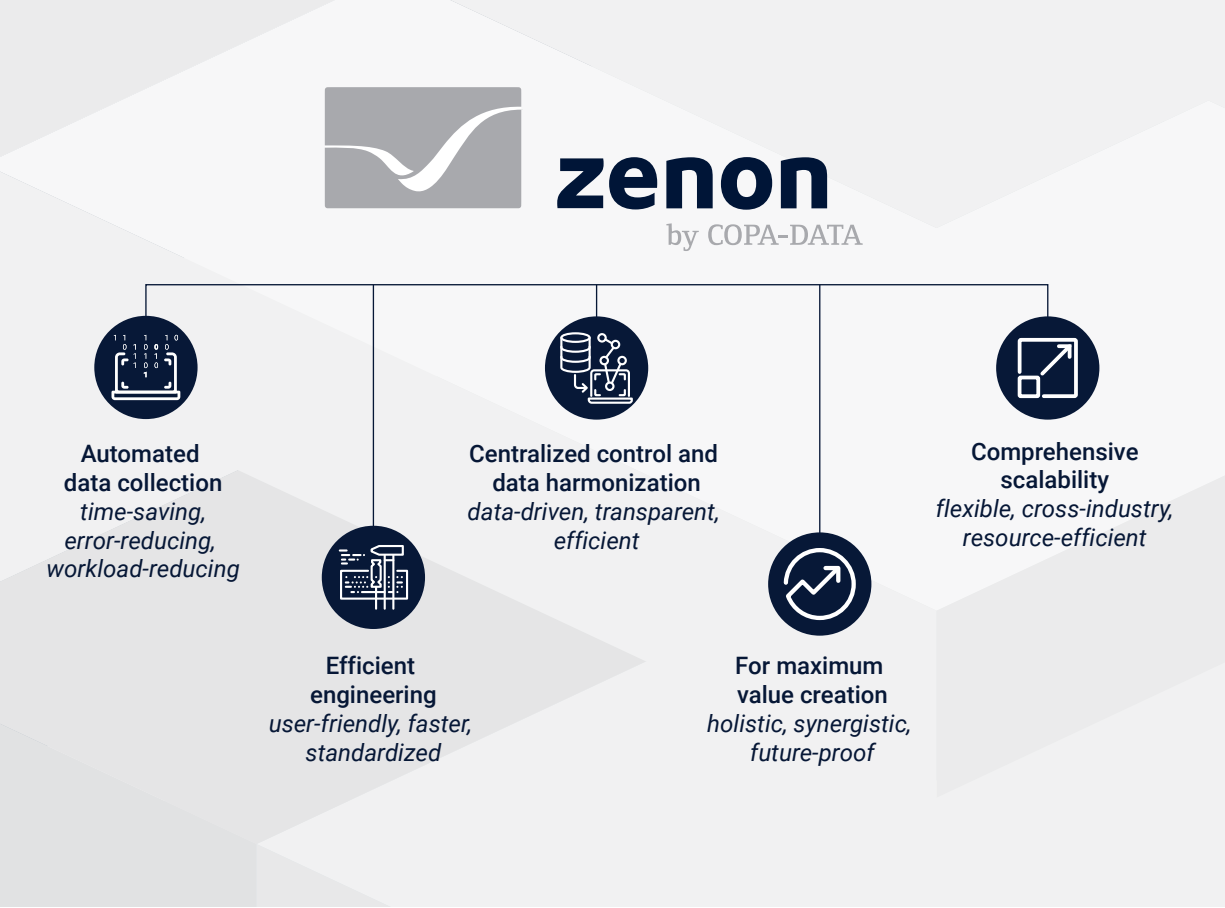
COPA-DATA's vendor-agnostic software platform zenon is designed not only to automate complex industrial processes but also to make them clear, robust, and user-friendly. Key priorities include efficient engineering, ease of use, and scalability.

1. Automated processes, less manual effort

In many businesses, process data is still recorded manually on paper. However, zenon helps these companies replace manual tasks with automated data collection, analysis, and process control. This not only reduces potential errors but also relieves employees of routine tasks that are often particularly labor-intensive and somewhat less fulfilling.

2. Efficient and automated engineering

The low-code or no-code platform is designed to enable users to create complex automation projects without programming knowledge – by simply setting parameters and using templates and intelligent objects. This reduces the need for specialized programming while at the same time increasing quality through standardization. It also allows for faster rollouts, true to the principle of "doing more with less."



3. Central control and data harmonization
zenon links data from machines, production lines, and IT systems in a central environment. This creates transparency regarding equipment status and real-time KPIs, enabling data-driven decisions. As a result, personnel resources can be used optimally, for example, through targeted monitoring instead of constant manual on-site checks.

4. Scalability for diverse sectors and applications
Whether in food and beverage production, energy infrastructure, or the pharmaceutical industry, zenon adapts flexibly to diverse requirements. Additionally, it enables the creation of synergies between different disciplines: from production and building automation to on-site energy generation and storage. Alongside horizontal scaling across various sectors and applications, zenon offers the possibility of starting with small projects and subsequently growing them. This ensures maximum cost efficiency and futureproofing.

5. Holistic approach for maximum added value
The use of zenon in the widest range of areas, for example, at an industrial site, reduces the effort required for employee training and development. In addition, the resulting standardization of the system landscape creates new synergies and added value that have a direct positive impact on operations.

In summary, it is safe to say that the zenon software platform not only eases the shortage of skilled workers in businesses but also directly enables users to create added value through greater resilience, competitiveness, and sustainability.

HOW ZENON EASES THE SKILLS SHORTAGE THROUGH DAILY OPERATIONS

Here's a real-world example. In production, zenon can fully or partially automate repetitive testing and inspection processes. Too often in industry, process data is still recorded manually on paper and then transferred manually to digital systems. This method carries high risk, is prone to errors, and ties up valuable personnel resources. With the "Paper on Glass" solution, this process is completely automated and digitalized using zenon. Thanks to full integration of zenon in operational processes, production data is captured and analyzed at the same time. This means that the necessary reports, for example, for batch release, are available immediately once the process is completed. Safety or inspection lists can then be processed using a PC, mobile devices, or directly at the machine. Analysis errors that can result during strictly manual processes are avoided.

In the energy sector, zenon provides support through remote monitoring and central control room solutions. Fewer on-site checks allow for the more efficient use of specialist personnel, for example, in the event of non-conformances, escalations, or in the strategic planning of system maintenance activities.

SUMMARY: ACTIVELY ADDRESSING THE SKILLS SHORTAGE THROUGH DIGITALIZATION, AUTOMATION, AND STANDARDIZATION

The skills shortage is not a purely local phenomenon. It is a global structural problem that affects efficiency, innovation, and growth. Global analyses, such as those by Deloitte, emphasize the increasing pressure on companies to explore new approaches to work organization, automation, and talent development.

The zenon software platform can play an important role in meeting the challenges of the skills shortage, as it automates repetitive tasks, creates transparency, and supports employees in value-adding activities. As a result, it generates efficiencies and makes internal processes more attractive. This is an essential step in strategically reducing employee workloads and preparing for the future of work.

SKILLS SHORTAGE & AUTOMATION BY THE NUMBERS

Global labor market in transition

- 39 percent of core competencies in businesses will change fundamentally by 2030.
- Only 41 percent of employees currently have the skills that companies need to close these gaps.

Leveraging automation to remove bottlenecks

- In approximately 60 percent of all jobs, at least a third of their component tasks could be automated.
- According to analysts, automation is increasingly being used to compensate for labor shortages, not primarily to reduce costs.

Work is not being replaced, it's redistributed

Businesses with successful automation report higher productivity because employees are relieved of routine tasks.

JOHANNES WOLF
Managing Director
COPA-DATA CEE/ME

Johannes Wolf is the Managing Director of COPA-DATA CEE/ME, which is responsible for more than 30 countries in Central and Eastern Europe and the Middle East. He understands the challenges in industry and the energy sector and is convinced: There must be an easier way – with zenon from COPA-DATA.

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PRODUCTS & SERVICES

HAVE YOU HEARD OF THE ZENON ELVES?

In a world filled with complex tasks, where standards are high and finding skilled professionals is becoming increasingly difficult, wouldn't it be great to have some clever little assistants to help you with your work? Project automation wizards in zenon can do exactly that.

Imagine that you are a project engineer who does recurring tasks every day in zenon projects, such as creating 1,000 zenon variables, complete with their properties, based on an Excel file or instantiating 200 symbols across various screens, with appropriate variable substitution, based on an XML file.

Your end customer also expects all projects to meet their company's unique standards. In other words, the user interface has to be familiar to end users from day one and ready to use globally across all the business' locations. Other requirements include standardized alarm messages and reusable project content. Plus, the project has to be easy to maintain.

More than likely, the client project you are working on has specialized functionalities and complex workflows. These may include industry-specific zenon functionalities, such as configuring command groups in the energy sector or zenon Logic programs that require PLC programming skills and additional process knowledge.

All of this can be automated using an Add-In Wizard in zenon Engineering Studio. Traditional examples include automated creation of projects for substations or quarries or zenon projects for equipment manufacturers. In most cases, the projects are similar and vary only in the number of devices/sensors or the use of different device types/sensor types.

WHAT DO THE WIZARDS HAVE IN COMMON?

- Our Add-In Wizard is built on a generic zenon basic project.
- There are customer-specific files (e.g. Excel, XML, SCD) that already contain system-specific data (e.g. communication properties, alarm information, etc.).
- These files can be interpreted by our Add-In Wizard and transferred into the zenon environment.
- The result is a zenon project that creates and configures zenon project content based on these customer-specific files – with just a few clicks and in moments.

WHAT ARE THE RESULTING BENEFITS?

The Add-In Wizard eliminates repetitive tasks that can be error-prone, monotonous, and demotivating. This boosts team morale and saves a significant amount of time – time which engineers can invest in designing the architecture, developing the concept, or optimizing the system.

In addition, the Add-In Wizard creates a zenon project of consistent high quality in which the content depends on customer-specific input files. This automatically ensures enterprise-wide standards and improves collaboration. As a result, users are able to work across locations without having to train on specific equipment for the zenon project. This means they are productive immediately. Standardized training materials can be created and the number of isolated solutions can be reduced.

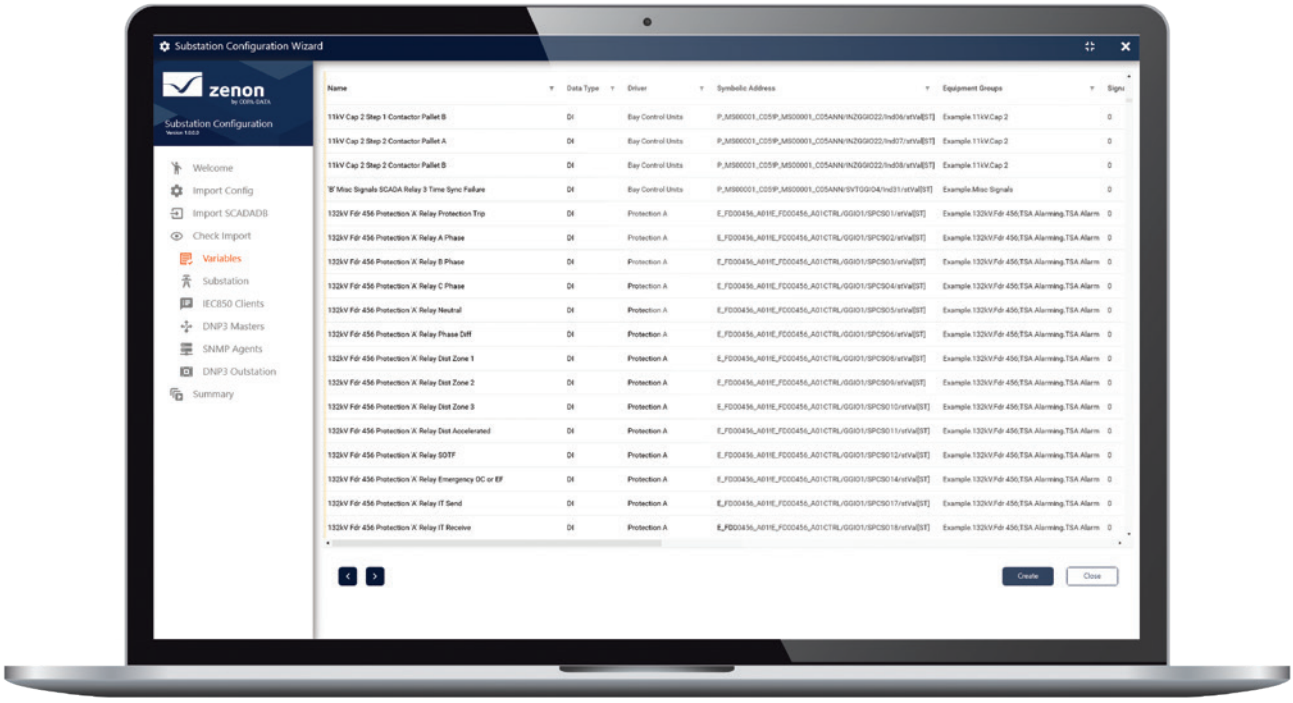
At the same time, the bus factor increases. This is a risk metric representing the number of key team members who, if suddenly absent, would cause the project to stall because of the lack of specialist knowledge. If one person being absent could cause the project to stall, the bus factor is one. Because the zenon wizards eliminate the dependencies on specialist knowledge, in projects where they are used the bus factor rises. If everyone can progress the project without specialist skills, the bus factor is as high as the number of people in your overall team.

Ultimately, the wizard reduces project risk because it "knows" the complex workflows and the necessary industry-specific functions. As a result, even individuals unfamiliar with the specific processes or system integrators can create customer projects without needing to know every single detail. This is ideal for global operations and it also improves scalability.

Imagine working in a pharmaceutical environment where every project change has to be validated. This step disappears – it is no longer necessary – when users allow an Add-In Wizard to create zenon projects automatically. In this scenario, while the wizard itself has to be validated under GAMP Category 5, every subsequent project or project modification generated by the wizard is validated automatically, because it falls under GAMP Category 4 (page 132, ISPE GAMP® 5: A Risk-Based Approach to Compliant GxP Computerized Systems (Second Edition) | GAMP).[1] This saves a huge amount of time and also reduces validation costs significantly.

HOW CAN AUTOMATION WIZARDS BE CREATED?

The ability to create projects automatically in zenon has been available since version 6 of the software. It began back with VBA and VSTA. Since zenon 7.60, the add-in framework has served as the standard for customer-specific add-ons in zenon, covering both Engineering Studio and Service Engine. It is possible to create, edit,



The user is provided with an overview of the drivers and their connections, which are generated by the wizard.

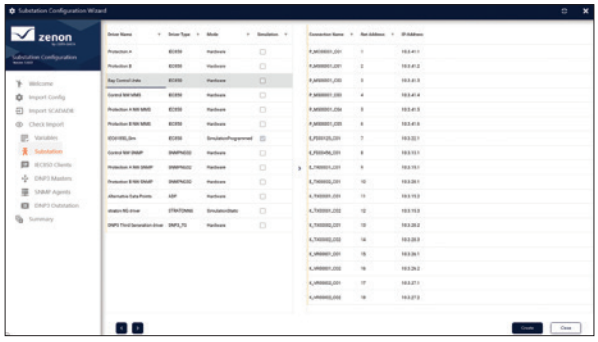
[1] https://guidance-docs.ispe.org/doi/book/10.1002/9781946964571

or import both zenon project properties and zenon project content (e.g. drivers, variables, functions, screens, symbols, Smart Objects, Logic Code, etc.). You can get a comprehensive overview of these capabilities by consulting the zenon API poster.[1]

Additionally, COPA-DATA supports you with our Professional Services teams. They are ready to help you create an automation wizard or a basic project.

USE CASE: GENERATING A SUBSTATION

After covering a range of theoretical possibilities and information here, it is time to look at some examples of applications. One typical example comes from the energy industry: the automated creation of projects for substations. In this context, there is usually a standardized Substation Configuration Description (SCD) file that describes the configuration of a substation. This Add-In Wizard also uses an additional customer-specific Excel file containing information regarding network topology, DNP3 gateways, and other variable properties. The automation wizard imports the necessary files and validates them. Subsequently, an overview is displayed showing which zenon project elements will be generated.



With a single click on the "Create" button, all the elements displayed are generated and configured in the project in just a few minutes. In this example, the wizard generates the following zenon project elements:

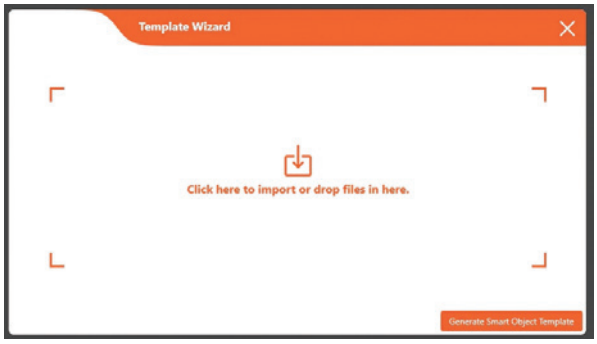
- 13 drivers with a total of 95 connections
- 5,000 variables
- 45 symbol instances including substitution rules
- 3 zenon Logic programs with 200 lines of ST code and 1 IEC 61850 server
- 1 archive with 200 variables
- 1 DNP3 process gateway with 300 variables
- 1 equipment model with 59 equipment groups

The wizard needs only 10 minutes to do all of this.

USE CASE: EFFICIENT VALIDATION PROCESSES IN THE PHARMACEUTICAL INDUSTRY

Another example comes from the pharmaceutical industry. Here, a client faced the challenge of validating new equipment in a production line. This also applied to changes in logic code or modified process phases. To avoid having to revalidate every single change, two automation wizards were developed to complete the following tasks:

- **Template Wizard**
  Based on a zenon base project and a customer-specific Excel file, which was added per drag&drop, devices (e.g. furnaces, agitator ball mills) were generated in zenon as Smart Object Templates that already contain the corresponding Logic code, zenon variables, and overview screens.



- **Instance Wizard**
  The Instance Wizard is used to define the variable mapping for selected devices. These devices were previously created using the Template Wizard. During this process, variables from the Smart Object Template are linked to PLC variables. This can be performed either manually in the wizard interface or using a generated Excel file. The user receives an overview of the Smart Object instances that are created, including the variable assignments.

In addition, the wizard creates zenon archives to detect changes in the values of device-specific process variables at various phases (start, stop, dynamic value changes). As a result, process values for an active

[1] https://www.copadata.com/en/zenon-characteristics/automated-engineering/

batch are recorded and stored in an SQL database using zenon archiving. Finally, the wizard adds selected device variables to an OPC UA process gateway, making these values available to OPC UA clients.

With these two validated automation wizards, the customer can now rapidly implement changes to the line or process phases. The customer consistently obtains the same standard result, which reduces manual errors and eliminates the need for re-validation.

REQUIREMENTS FOR AN AUTOMATION WIZARD

- A well-designed and modular concept developed closely with the customer is the key to success.
- As generic as possible, as customer-specific as necessary.
- Product features provided by zenon as standard should be preferred over customized solutions (i.e. in the basic project).
- The format and content of the required input files and zenon base projects have been confirmed by the customer.
- All wizard entries (including files) are validated in order to detect potential errors at an early stage and the user must be informed of them.
- A clear and intuitive user interface guides the user through the wizard. Required user inputs are self-explanatory.
- The wizard should inform users about the steps being performed and log warnings or errors.
- A progress bar opens while the wizard is running. This allows users to see that the wizard is working and how much longer it will take.
- Documentation is provided that describes the necessary conditions, settings, and process.
- The wizard has a modular structure, allowing potential customer enhancements to be easily added.
- Exceptions, out-of-scope activities, and any constraints of the wizard should be discussed with the customer.

SUMMARY

As you can see, the project automation wizards in zenon can help you keep project engineering times short and mitigate shortages of skilled personnel. Tasks that previously took days or weeks can now be completed in just a few minutes or hours. Unlike the elves who are Santa's little helpers, these wizards always provide their services reliably. COPA-DATA is working continuously to make its wizards even more versatile and innovative.

CHRISTIAN BAUER
Team Lead Professional Services

Christian Bauer has been with COPA-DATA since 2013 and leads a Professional Services team responsible for implementing customized solutions for clients. In this role, he collects client requirements, develops relevant concepts, and translates these into concrete developer tasks in order to provide clients using zenon with the best possible solutions.

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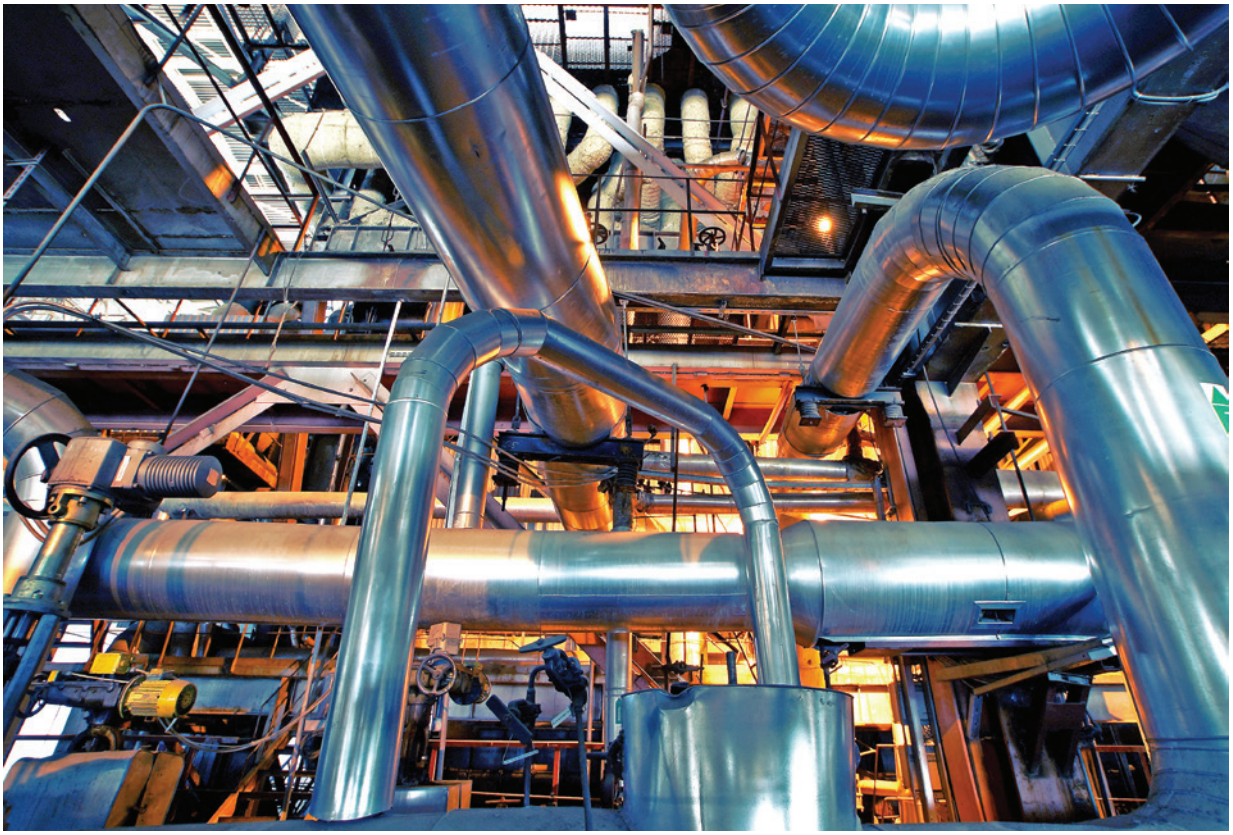

ORCHESTRATION STUDIO: THE HEART OF MODULAR AUTOMATION

Process automation as we have known it over the past few decades is undergoing a major transformation. Flexible, open, and modular solutions based on software-defined automation are taking the place of rigid, hardware-centric distributed control systems (DCS). In this environment, our Orchestration Studio enables our customers to adopt a new approach to engineering.

Based on the software-centric OpenDCS philosophy, Orchestration Studio utilizes the Module Type Package (MTP) standard, but it can also be used independently of it. The MTP standard was introduced about 10 years ago, and even back then, it was clear to COPA-DATA that the industry demanded a shift in the way automation projects are created. That's why we developed right from the beginning and continue to consistently refine the modular concept and zenon Orchestration Studio.

MANAGEMENT OF EQUIPMENT TEMPLATES AND DEVICES

A key component of Orchestration Studio is Template and Device Management. This component includes a Template Editor that enables users to create, edit, and validate standard-compliant MTP files. In addition, the Editor can be used to create Typicals, which are standardized functional units made from various OpenDCS basic elements. For example, fan elements can be assembled from the basic modules for a motor, multiple analog temperature values, and any required interlocking elements. The templates already include descriptions for HMI screens, functions (known as Services), alarm definitions, and much more. This makes it possible to automatically create complete zenon projects later on… more about this later.

Device Management is used to manage the actual physically present devices. For instance, if the system

includes multiple fans based on a previously created template, a separate device is created in Orchestration Studio for each physical fan. In Device Management, settings such as Connection Parameters are configured. For OpenDCS devices, the underlying PLC system is also specified here. This may be zenon Logic, a Siemens controller, or, in the near future, a Rockwell or Mitsubishi controller.

THE BENEFITS QUICKLY BECOME CLEAR

So far, this may sound rather complicated and seem to involve additional effort. But what are the benefits? Well, the steps outlined so far are one-off tasks or, if part of regular operations, they only need to be adjusted when changes occur in the resources pool. These preconfigured devices can now be deployed flexibly, modularly, and repeatedly across a wide variety of projects. This reduces engineering effort and ensures greater consistency. It also enhances quality in modular automation concepts. Similarly, pre-validation and qualification are supported at device level. Each module is qualified independently, which greatly reduces the time required for the subsequent overall qualification of the complete system.

DRAG-AND-DROP PROJECT ENGINEERING

Let's turn now to project orchestration. This is where the individual orchestration projects are created, serving as the source for the zenon projects subsequently generated. In the orchestration environment, individual devices are positioned using drag-and-drop functionality. A logical view provides a technological overview, while the HMI screens can be configured to display the future Piping and Instrumentation Diagrams (P&IDs), complete with graphical elements derived from the device templates. The primary focus here lies on modeling the process rather than on the technical configuration of individual zenon elements. This enables specialist personnel, even those without in-depth SCADA expertise, to independently implement changes to existing systems or create new projects from scratch.

ZENON PROJECT GENERATION

Once orchestration is complete, the Orchestration Studio generates a zenon project. This process is based on a template project provided by COPA-DATA. It can, of course, be customized to meet specific customer requirements. During generation, all necessary zenon components, including Smart Object Templates, detail screens, drivers, variables (complete with addressing), archives, and a comprehensive batch configuration, are created automatically for every device included in the orchestration. Additionally, when configuring OpenDCS devices for zenon Logic controllers, an accompanying zenon Logic project is also generated. This project contains the corresponding PLC code written in Structured Text (ST). Upon completion of the generation process, the runtime files are created, and the zenon project is ready to launch.

SUMMARY

As an integral part of the zenon software platform, Orchestration Studio simplifies project configuration, ensures projects remain maintainable, and reduces error rates through automated engineering. This enables team members to quickly get up to speed on a project, even without a lot of prior knowledge. To sum up, Orchestration Studio reduces engineering effort and helps mitigate the shortage of skilled professionals. It also enhances consistency throughout the entire project. Above all, this saves both time and cost during the configuration and validation phases. Lastly, thanks to centralized deployment and hardware independence, you can respond to changes more rapidly. The objective is clear: hardware-independent, flexible, and modular. That's how we aim to design automation projects, both today and tomorrow.

BERNHARD SCHUIKI
Product Manager

Bernhard Schuiki joined COPA-DATA in 2006. Since 2023 he has been working as a Product Manager. Working closely with Industry Management, he plans and coordinates the further development of the zenon Software Platform for customers in process automation, including Orchestration Studio, MTP, and OpenDCS.

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DEVICE ONBOARDING MADE EASY: STEP-BY-STEP WITH ZEROCONF

With ZeroConf, zenon Device Management provides an easy way to integrate Linux controllers in the zenon software platform. In this article, we look at how to use and configure the tool.

In IU 44, we discussed the features of ZeroConf in the article "zenon Device Management– What's New?" Essentially, the idea is to prepare Linux controllers using an installation script in order to later allow their fully automated integration in the zenon software platform. This articles takes a deeper dive into the technical details. We will take a step-by-step look at how to configure and use ZeroConf.

BASIC REQUIREMENTS

At the outset, various requirements must be met to ensure that ZeroConf can be used.
These include:

- A working installation of the zenon IIoT Services must be set up and accessible on the network. Here, we are using version 16.0 (pre-release) of IIoT Services.
- A Linux-based controller with an ARM64 or AMD64 processor architecture must be available. Any controller-specific setup steps must be completed already. The Docker Engine must be installed on the controller. Examples include the Siemens IOT2050, Beckhoff CX9240, or Revolution Pi Connect 4.
- In addition, the systems used require active internet access in order to download container images.
- ZeroConf cannot be obtained via the website's download area. Instead, it has to be requested through the responsible COPA-DATA branch, a COPA-DATA distributor, or COPA-DATA support.

PREPARATION OF IIOT SERVICES

When beginning preparations, you should configure the access permissions required for the subsequent controller onboarding in IIoT Services. To do this, a new Custom OAuth2.0 client is created in Identity Management. The required parameters can be found in Listing 1 and Figure 1, respectively. The automatically generated secret, along with the Client ID and the IIoT Services URL, has to be stored in a new text file named "zeroconf.json" (see Listing 2).

```
Client ID:              zero-conf-client
Client name:            zero-conf-client
Grant types:            ClientCredentials
Allowed scopes:         identityAPI.full _ access,
                        certificateManagementAPI,
                        deviceManagementAPI
```

Listing 1 – Parameter für Custom OAuth 2.0 Client

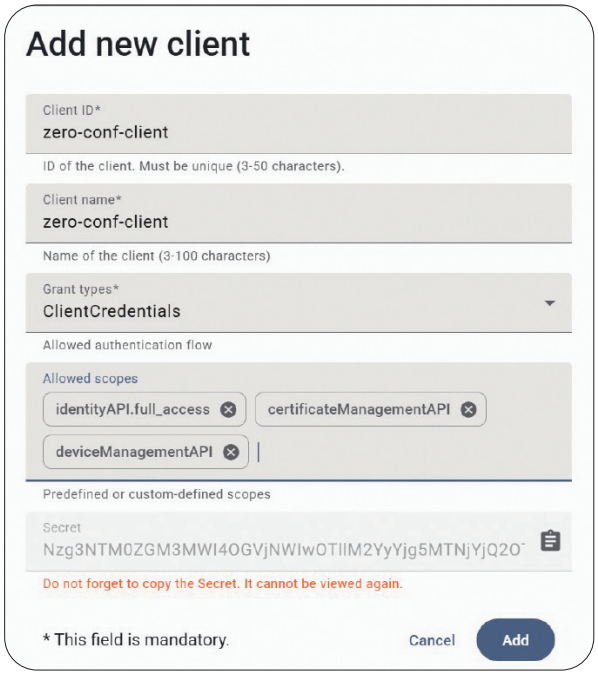

Figure 1: Screenshot of Custom OAuth 2.0 client.

```
{
    "iiot-services-url": "https://my-iiot-services.local.
    domain:9443/"
    "client-id": "zero-conf-client",
    "client-secret":
"Nzg3NTM0ZGM3MWI4OGVjNWIwOTllM2YyYjg5MTNjYjQ2OTA1
ZjFiM2FmNDY4Y2Y3MmYwMWU2ZGViNTQ4ZDZlNg=="
}
```

Listing 2 – Inhalt Datei zeroconf.json

You must also grant the created client the necessary permissions to register new controllers with IIoT Services.

To do this, use the group management tool to add the client to a group with the required permissions. This could be, for example, the pre-existing group "Service Connection Commissioner". If a different group is used,

ensure that you grant it only the minimum permissions necessary. Figure 2 illustrates the steps for assigning the client in group management.

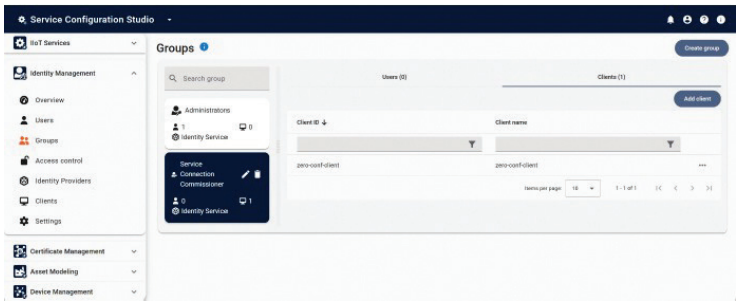

Figure 2: Screenshot of client assignment in group management.

PREPARATION OF THE USB DRIVE

Once you have created the required OAuth 2.0 client to automatically register device agents, you can prepare the USB drive. For this purpose, a USB drive is required that features a file system readable by both Windows and Linux, for example, exFAT.

First, copy the "zeroconf.json" file to the root directory of the USB drive. In most cases, you will also need to provide the controller with the root certificate for IIoT Services in order to establish a trusted connection during commissioning. As long as IIoT Services are using the automatically generated HTTPS certificate, the corresponding root certificate can be downloaded via the Certificate Management interface and saved in the root directory of the USB drive as "ca.crt".

If you are using a custom-configured HTTPS certificate, you have to instead save the corresponding intermediate and root certificates, combined in a single file named "ca.crt", to the USB drive.

With these steps, the basic configuration of the USB drive is complete. Thanks to the information available on the USB drive, the controller, or the device agent, will be able to register itself with Device Management at a later time.

As sensitive access credentials are stored on the USB drive, it is essential to keep it secure and to make it available only to trusted individuals.

For customization purposes, you can also save what are known as "pre-registration" and "post-registration" scripts on the USB drive. These run automatically on the controller before (and after) registering the Device Agent.

To do this, you can place any .sh scripts in the "pre-registration-scripts" and "post-registration-scripts" folders. These will then be run during the registration process and can carry out any configuration steps.

The mechanism described above offers a wide range of applications. It can be used to facilitate specific configuration steps, such as setting proxy parameters and configuring a designated Network Time Server or to install required software packages. Additionally, you can store other files on the USB drive; these files can then be copied to the controller by the scripts, for instance, or used as a basis for applying individual ccontroller-specific network settings.

The exit code of individual scripts can also be used to control whether execution of subsequent scripts or registration of the Device Agent is canceled. An exit code of 0 indicates that no error occurred; subsequent scripts and the registration proceed as planned. An exit code other than 0 is interpreted as an error and cancels the running of subsequent scripts as well as the registration of the Device Agent.

Listing 3 illustrates, by way of example, the validation of the hostname. The registration procedure is canceled if the controller's hostname does not start with "DEV-".

```
#!/bin/bash

echo "Hello from script 00_check_hostname.sh"
echo "In here we can run custom linux commands to set
configurations or do other things BEFORE the Device Agent gets
registered."

# Exit with 1, if the hostname does not start with "DEV-"
if ! [[ $(hostname) =~ ^DEV-.* ]]; then
    >&2 echo "Hostname $(hostname) does not start with 'DEV-'.
Will cancel registration."
    exit 1;
fi

echo "Hostname $(hostname) does start with 'DEV-'. Registration
is allowed."
exit 0
```

Listing 3 – Beispiel-Skript "00_check_hostname.sh" zum Prüfen des Hostnamens

To configure the Device Agent and Service Engine Docker containers, the required "docker-compose.yml"-file is downloaded by default directly from Device Management during registration and is used as a baseline.

If the planned configuration of the zenon project requires it, you can specify special settings – such as open ports, network adapter mappings, or similar parameters – within a customized "docker-compose.yml" file. This configuration is then applied when executing Service Engine and Device Agent.

If this is required, we recommend that you download the "docker-compose.yml" file once via the Device Management interface, make the desired adjustments to it, and then save the content, also named "docker-compose.yml", in the root directory of the USB drive. Additionally, the ".env" file allows you to reuse selected parameters from the initial ZeroConf configuration step. Detailed information regarding this can be found in the zenon User Manual.

Now, the setup of the USB drive is complete. It is ready for "plug-and-play" use with the controller, which will be prepared in the next step. The contents of the USB drive are shown in Figure 3.

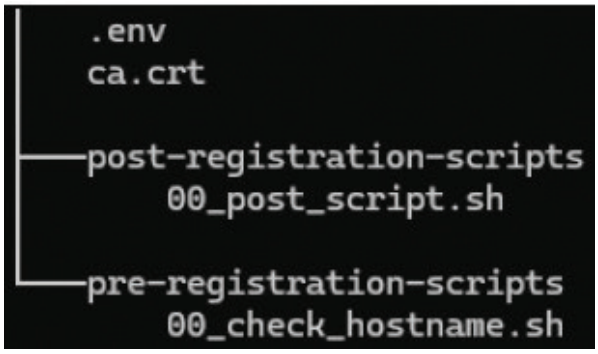

Figure 3: Contents of the USB drive displayed in file and folder structure.

PREPARATION OF THE CONTROLLER

To prepare the Linux controller, functional access to it is required, most easily via SSH.

First, copy the ZeroConf tool to the controller, for example using SCP, the tool associated with SSH.

You may place the ZeroConf tool in any directory; for example, "/home/user". To make it executable, use the line command "chmod +x ZeroConfProvisioner".

```
sudo ./ZeroConfProvisioner.py install --se-version 16 --iiot-
version 16.0 --register-usb-listening-service
```

Listing 4 – Befehl für die Konfiguration des Controllers

In this step, ZeroConf performs a range of configuration settings and carries out several preparatory steps. Specifically, a USB listener is set up to detect the connection of the prepared USB drive at next system startup.

The controller is now fully prepared and can be placed subsequently in storage or handed out to customers or service technicians.

USING THE CONTROLLER AND CONNECTING TO THE ZENON PLATFORM

When the controller is later deployed and connected to the power supply and network cable at the installation site, it starts up automatically and waits for the user to insert the prepared USB drive containing the access credentials, certificate, and pre- and post-registration scripts.

Once the USB drive is connected, the controller automatically starts the registration process. At the same time, the registration progress can be monitored in Device Management. If the controller and the USB drive have been correctly prepared in the preceding steps, the newly registered Device Agent will be displayed automatically in the Device Management interface.

If registration fails, you can use the automatically generated and time-stamped log file on the USB drive to identify the cause and correct any settings or configurations. The log file is also helpful for verifying successful registrations.

After successful registration, you may remove the USB drive. Subsequently, additional controllers can be connected to Device Management in a step-by-step fashion. To do this, simply connect the next controller to the power supply and the network and then insert the USB drive. No modifications to the USB drive are required for this process, as its contents have been prepared for use across multiple controllers and can, therefore, be reused.

USING THE CONTROLLER WITH DEPLOYMENT TASK

Once the controller in question is successfully connected to Device Management, the desired zenon project can be transferred remotely to the controller using a Deployment Task. The other features of Device Management can now also be used; for example, to monitor the status of Service Engine or retrieve application logs.

The controller is now up and running and is part of the zenon installation.

WITH ZEROCONF TO SUCCESSFUL ONBOARDING

In this article, we have shown how the step-by-step configuration and application of ZeroConf can be applied in conjunction with Linux controllers and zenon Device Management. When implemented correctly, ZeroConf can, significantly simplify the onboarding of new controllers as no specialized device-specific knowledge is required for commissioning. In this scenario, preparing the controllers and IIoT Services are the only activities that call for specialized knowledge of Linux and zenon.

MATTHIAS SCHNÖLL
Product Manager

Matthias Schnöll joined COPA-DATA in 2015. He has been part of the Product Management team since 2018. As a product owner, he works on developing the zenon software platform. His main focus is on zenon IIoT Services and all cloud-related issues. He considers bridging the gap between OT and IT as one of today's most important challenges.

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ZENON ENGINEERING ASSISTANT: FROM CATERPILLAR TO BUTTERFLY

The labor market in the 21st century is undergoing a metamorphosis, perhaps best described as a time of major upheaval and labor shortages. Digitalization can provide a solution in certain areas by making information retrieval easier and automating steps in the value chain to reduce the workload on skilled workers.

Advances in technology have often led to major social changes in the past – for example, mass migration from farms to cities. Today's challenges, including demographic shifts, globalization, and all types of crises, call for new problem-solving approaches. Changes in personal values, such as a stronger focus on work-life balance, impact working life just as deeply as the much-discussed shortage of skilled labor. With zenon Engineering Assistant, tasks can be completed quickly, accurately, and 24/7 globally from anywhere, which frees up time and resources for other activities.

STRONGER FOCUS ON AGENTIC AI

Today, few fields are evolving as rapidly as artificial intelligence (AI). This evolution can be seen in zenon Engineering Assistant, which has advanced in leaps and bounds since its initial rollout. Major enhancements include the transition to GPT 5.2 and a significantly stronger focus on Agentic AI. As a result, Engineering Assistant is no longer simply an AI entity. Rather, it is a continuously expanding network of individual agents. Each of these agents is equipped with specific tools and specializes in a distinct domain. Engineering Assistant

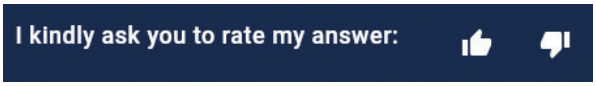
has access not only to the entire content of zenon Online Help but also draws on tutorials, videos from zenon Academy, and entries from the Knowledge Base descriptions. And, to ensure that it is always up to date, access is being added as quickly as possible to additional reliable sources of information.

NO MORE LANGUAGE BARRIERS

Language barriers are also a thing of the past. Simply enter your query or prompt in your preferred language and the online translation feature does the rest. This is a major plus – and should not be underestimated, as the new feature supports nearly 80 different languages. As a result, employees can easily find and understand the information they seek. That benefits both zenon newbies and seasoned pros. It can also make it easier to onboard new employees or train existing employees on specialized topics. In addition, through better organization of existing information sources and, moreover, through improved knowledge transfer, companies can respond effectively to the shortage of skilled workers. However, this represents just one of several steps. In the long run, the potential of low-threshold services to gather information should not be underestimated.

FEEDBACK ANALYSIS

Engineering Assistant is a domain-specific chatbot trained on internal documentation and company material. No sensitive customer data is fed into the training material, which ensures that data privacy is always protected. You can also help to improve the program's responses simply by providing feedback.



THERE ARE SEVERAL GOOD REASONS WHY YOU SHOULD ALWAYS RATE THE ANSWERS YOU RECEIVE FROM ZENON ENGINEERING ASSISTANT.

- **To ensure users' questions are answered**
  The evaluation step allows you to check whether Engineering Assistant actually supports users implementing projects in zenon. Are its answers correct? Do its instructions make sense? Is it providing users with useful workflows and technically accurate results?

- **To prevent errors**
  Incorrect recommendations can lead to design flaws, wasted time, or system issues. The evaluation step helps to identify gaps in documentation or erroneous instructions at an early stage. Incomplete answers point to gaps in documentation. Your feedback enables aspects of the underlying documentation or knowledge base that lack sufficient depth or clarity to be identified and improved.

- **To stay in the loop in automated decision-making processes**
  As a "human in the loop", you can identify incorrect responses, provide clear explanations, and contribute directly to further improving Engineering Assistant.

- **To validate domain expertise**
  Since Engineering Assistant was trained on company-specific documentation and terminology, your evaluation ensures that internal terminology, framework conditions, and best practices are interpreted correctly.

- **To reduce security and compliance risks**
  Ongoing evaluations help to ensure that Engineering Assistant does not spread incorrect information, does not provide non-compliant recommendations, and accurately reflects the content of the official documentation. To this end, the training material does not contain sensitive customer data.

- **To strengthen trust and acceptance**
  The use of Engineering Assistant will grow once the responses are known to be consistent, accurate, and understandable.

- **To provide a basis for continuous improvement**
  Targeted improvements to models, prompts, training data, and documentation are possible only by continually analyzing responses.

LOOK INTO THE CRYSTAL BALL! THE TRANSFORMATION CONTINUES

While the Engineering Assistant has so far been used mainly as a 24/7 web app for sharing knowledge, other potential applications are now emerging.

One thing is already certain. In the future, user instructions can be implemented automatically in Engineering Studio by Engineering Assistant or its extensions. So, it will be possible to create variables in zenon based on a signal list (inputs, outputs, and their interconnections), without manual intervention.

However, we can go one step further and imagine another potential application for AI in engineering that would involve transferring a design draft for a zenon screen into Engineering Studio. Engineering Assistant would create the corresponding screen in the Engineering Studio and then configure it. Through interactive prompts regarding the required screen elements, such as buttons, these elements would be generated. The next step in this direction involves the application of AI in defined use cases within the Service Engine, for example, collecting and analyzing process data triggered by alarms, and thereby making it easier to analyze issues.

In the near future, Engineering Assistant could just as easily be deployed to improve existing processes.

For example, AI could help to achieve goals such as reducing energy consumption or saving time in process workflows.

We invite you to start thinking about how Engineering Assistant will make your daily work easier – today and every day from now on.

TIPS & TRICKS FROM THE TCT TEAM FOR BETTER RESPONSES FROM ENGINEERING ASSISTANT:

- Open a new chat to ensure that the context for your prompt is not skewed by previous queries.
- Pay attention to the length of your prompt. If it is too short (≤ 3 words), it often fails to provide sufficient context.
  Tip: Try breaking down larger issues into a series of short, consecutive questions.
  Example:
  - Vague: "env files"
  - Better: "What are .env files used for?"
- If prompts are too short, Engineering Assistant will ask for additional information. However, overly long prompts should also be avoided, as this can lead to imprecise answers.
- Formulate specific prompts. For example, specify the relevant version and the full product name of the service to receive a high-quality answer to your question.
  Example:
  - Vague: "Requirements for Smart Objects?"
  - Better: "List the requirements for creating a Smart Object."
- Pay attention to your phrasing. Express yourself in clear, simple sentences and avoid unnecessary technical jargon. Remember, Engineering Assistant is based on COPA-DATA documentation and has no access to internal projects or customer data, so advice will not be application or project specific, and data is protected.
- Please help us improve. Always provide a rating and a brief comment so that we can improve our knowledge source and, by extension, Engineering Assistant.

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Tara Tan has a master's degree in Psycholinguistics and Neurolinguistics, and speaks Malay, English, and German, in addition to Japanese. She has been with COPA-DATA since 2023, and manages the company's localization projects. She also evaluates content and query results for zenon Engineering Assistant.

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After completing electrical engineering training and working for several years in this area, Josef Ries turned to software documentation. Since 2016, he has been involved in creating and expanding the online help for the zenon software platform and has worked in a variety of positions at COPA-DATA.

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CLEMENS CONNECTED

DOT THE Is AND CROSS THE Ts IN SKILLS BREADTH

MARK CLEMENS
Product Manager
Connectivity

Mark Clemens has been part of COPA-DATA HQ since 2002. In his current role he is a product manager for connectivity topics. As an expert in cybersecurity, he helps connect IT, OT, and IIoT while keeping security in check. As a frequent IU author, he shares his views on the buzzwords of our time.

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Pulled by the promise of Industry 4.0 and pushed by the silver tsunami of skilled engineers retiring from the profession, automation and digitalization continues at pace. How do we ready this and the next generation of automation workers to deliver tomorrow's innovations?

During my education, I learned the skill of creating cable trees using wire lacing. I regret that, in my career to date, I am yet to apply it in practice.

I'm not sure whether my learning of this so-far superfluous skill represents a failing in my education. Either way, it raises a question: How do we prepare the next generation of industrial engineers with the right skills for our rapidly changing present and uncertain future?

Manufacturing is not attracting enough young talent. Birth rates are decreasing. Younger generations generally receive higher education. The attitude of younger generations towards work-life balance weighs in towards the latter. Post-pandemic, there is a higher preference for desk-oriented jobs. With fewer people interested in manual labor or physically demanding manufacturing jobs, automation is not just a matter of modernization. It becomes a necessity for business survival.

Ironically, the process of automation and digitalization creates further skills challenges. During the process, fear of job losses will become a topic of discussion. In such transitions, employees often shift to different roles and responsibilities. Their ability to retrain becomes a crucial part of the success of the automation project and subsequent operations.

DIGITAL TRANSFORMATION

Increasing automation and the adoption of new technology creates a need for skilled technicians which cannot be completely filled by existing personnel. As we progress with digital transformation, skills requirements change. This is not immediately reflected in education pipelines.

The skillset of today's graduates is usually broad, reflecting the variety of OT topics, advances in mechanical and electrical engineering and, not least, IT and OT convergence. Yet, given today's rapid advancements and innovation, their curriculum includes technologies that – like my wire-lacing skills – will not prove their value or which have already been superseded by other technologies. And, as new skills are prioritized, it is inevitable that some skills may no longer be taught or be taught in less depth.

SOFTWARE-DEFINED AUTOMATION

The future looks brighter as digital transformation progresses to software-defined automation, especially when we factor in AI-assisted engineering and coding. Yet this also demands new skillsets. It challenges us in new ways of thinking, technology, and risks.

Software-defined automation enables us to easily apply new functions to existing devices without having to touch the existing hardware – or even without being present. Think about adding a gateway or virtual RTU func-

tion to an existing embedded Linux device by deploying a containerized Service Engine and a project with some zenon drivers and Process Gateways. Communication is enabled over virtually defined networks in compose YAML files using preconnected Ethernet interfaces.

In a project that represents software-defined automation at its most ambitious, the Mars rover Perseverance got a fascinating over-the-air (vacuum) update recently. Mars Global Localization uses an existing processor, previously used for communication with the Ingenuity helicopter, to compare images from Perseverance's camera with orbital terrain maps so the rover can precisely pinpoint its location. This feat was previously only possible with the help of humans on Earth. See NASA's Perseverance Now Autonomously Pinpoints Its Location on Mars - NASA for more details.[1]

A WIRE OR LESS

At some point, for almost any automation system, physical systems are involved. It will need physical components that must be controlled and interact with each other, perhaps relying on sensors and actuators.

Sensors, actuators, and controllers are still often connected via wires, so that even software-defined automation requires a human in the loop. It might surprise you to know that for the Mars rover Perseverance, cable trees were made using wire lacing. Wire lacing was used so it could withstand the vibrations and harsh temperature and radiation of space – and to reduce as much weight as possible for space travel.

THERE IS ALWAYS AN EASIER WAY

The connections of today and tomorrow may use Single-Pair Ethernet (SPE) with Power over Data Line (PoDL) or Ethernet-APL. They may even be completely wireless over 5G or 6G. While making it quicker and easier to connect, this development – and the technology behind it – requires yet more new skillsets.

This is where COPA-DATA can contribute: by implementing complex, new technologies and making them as accessible and easy to use as possible. And by providing access to automation and information so that LLMs can assist us with software-defined automation. This frees us to focus on the skills needed most in our industry – communication and problem solving – so that we can build optimal solutions for our customers.

THE SILVER LINING?

I don't know if platforms like RentAHuman.ai will become a future job market for software-defined automation projects created by agentic AIs. Here, people offer their skills as one-off tasks. Perhaps they will offer the skills needed in today's automation projects – maybe even wire lacing?

Who is to say which skills will be valuable in the future? At some point, I will retire. At that point, there will likely be even fewer people in the automation industry than there are now. My skillset in automation, broadened and deepened over years – and including my wire-lacing skills – will retire with me. After that, who knows? I might join a team of retirees to build a next-gen Mars rover.

Maybe we should be seizing the opportunity to learn from the silver tsunami leaving the workforce today and tomorrow. This way, we could preserve life-deepened skills and long-forgotten technologies that we may need to apply in the future.

How can we harness those skills in education pipelines and on-the-job learning?

WHAT IS WIRE LACING?

A skill younger people may not recognize and some older people never learnt, wire lacing is still applied today in specific environments. Wire lacing is the art of bundling wires, sometimes using waxed cord or tape, using specific knots like the running lockstitch or clove hitch, or more exotic ones requiring tools, like the Chicago stitch or Kansas City stitch.

[1] https://www.nasa.gov/missions/mars-2020-perseverance/perseverance-rover/nasas-perseverance-now-autonomously-pinpoints-its-location-on-mars/

INDUSTRIES & SOLUTIONS

SUSTAINABILITY COLUMN

LET'S RELEARN HOW TO LEARN!

Manufacturing faces unprecedented pressures, from geopolitics and climate change to disruptive tech and talent gaps. Success requires rapid learning and strategic capability building. To discover how individuals and organizations can lead this transformation, we spoke with two experts: Isabelle Hau of Stanford University and Dr. Meike Wiemann-Hügler at the University of Applied Sciences in Zurich.

INTERVIEW: EMILIAN AXINIA, DIRECTOR INDUSTRY MANAGEMENT, SUSTAINABILITY SOLUTIONS

Emilian Axinia: People are at the core of the accelerated digital and green transition in manufacturing. How can professionals design an individual learning path that not only keeps pace with change but also ensures they stand future-ready in the years ahead?

Isabelle Hau: The most important shift professionals must make today is moving from learning as accumulation to learning as adaptation. In fast-changing disciplines, especially manufacturing – which is undergoing digital and green transformation – the goal is no longer to master a fixed body of knowledge but to continually reskill, reconnect, and reimagine one's role.

A future-ready learning path starts with learning how to learn. This includes building meta-skills such as curiosity, sense-making, and reflection – capacities that allow individuals to integrate new tools, technologies, and information without becoming overwhelmed. Think of learning less like climbing a ladder and more like navigating a river: The current changes constantly and agility matters more than memorizing the map.

Second, professionals must intentionally develop human capabilities that cannot be automated. As AI and automation take over routine tasks, the differentiators will be relational and creative skills: Collaboration across disciplines, problem solving in ambiguous contexts, ethical judgment, and the ability to work effectively with both people and intelligent machines. In manufacturing, this might mean a technician who not only understands automated systems but can also work across teams to improve processes, mentor others, and translate data into decisions.

Third, learning must be embedded in real work, not treated as a separate activity. Short learning loops, micro-credentials, peer learning, project-based upskilling, and coaching are far more effective than one-off training sessions. Organizations can support this by creating cultures where experimentation is encouraged and learning from failure is normalized.

ISABELLE HAU
Executive Director, Stanford Accelerator for Learning (Stanford University) and author of "Love to Learn." An education and AI leader focused on future-ready skills, relational intelligence, and human-centered innovation.

A growing challenge is cognitive overload: People are asked to learn faster while managing constant change. The solution is not more content, but better design. AI can help personalize learning paths, surface relevant knowledge at the moment of need, and free up time for deeper human learning – such as reflection, dialogue, and shared problem solving.

Ultimately, staying future-ready is not about chasing every new technology. It is about cultivating a mindset of lifelong learning, grounded in human connection and purpose. When professionals align their learning with both technological fluency and human strengths, they don't just keep pace with change – they shape it.

You can read more perspectives from education research-

ers and leaders on what it means to be future-ready in the age of AI by following the QR code published below.[1]

Emilian Axinia: We're now looking at organizations driving progress across manufacturing value chains. How can they harness and innovate through collective skills while building an environment that supports learning and accelerated change?

Dr. Meike Wiemann-Hügler: In fast-changing organizational environments, success increasingly depends on how quickly organizations can learn by leveraging the collective skills and capabilities of their entire workforce. As automation and AI become standard, competitive advantage no longer lies in technology itself, but in how effectively organizations harness and foster human intelligence.

Human capabilities such as creativity, emotional awareness, and ethical judgment are especially critical in two situations. First, when diverse experiences and ideas are needed to generate innovative, out-of-the-box solutions. Second, when employees' situational awareness helps to earlier anticipate or to learn quickly from failures, to strengthen organizational resilience.

Two prerequisites enable this: psychological safety culture and trust-building management behavior. Psychological safety means encouraging open knowledge sharing, experimentation, the admission of mistakes, and the constructive expression of criticism – whether to generate new ideas or to prevent failures.

Following Clark's model[2] four stages of psychological safety are essential:

- Inclusion Safety: feeling accepted and valued
- Learner Safety: freedom to ask questions and learn from mistakes
- Contributor Safety: sharing ideas without fear of ridicule
- Challenger Safety: freedom to question decisions and propose change.

Such a culture of psychological safety can only be sustained through consistent, trust-building leadership. Particularly in times of transformation, management must role model that psychological safety. This clear focus on employees as capable, resourceful humans at the center of organizational decision making in an increasingly technologized world cannot be mere lip service. It must be a core organizational principle.

DR. MEIKE WIEMANN-HÜGLER
Deputy Director of the Center for Executive Education, Senior Researcher, and Business Consultant, University of Applied Sciences in Business Administration Zurich (HWZ). Leadership and organizational transformation expert focused on employee motivation, organizational culture, and learning.

This requires leaders to signal trustworthiness through:

- Integrity, i.e. keeping promises
- Competence, i.e. making sound decisions
- Benevolence, i.e. visibly investing in employee wellbeing.

Additionally, leaders must simultaneously demonstrate trust in employees, for example by:

- Delegating decision-making
- Enabling organizational settings for experimentation
- Accepting failure as an integral part of learning.

Psychological safety and trust are especially vital during the rapid integration of AI tools. Employees may feel dehumanized, obsolete, insecure, or have legitimate concerns about data security, bias, or qualification gaps. A psychologically safe approach ensures equal opportunities to learn about, use, experiment with, and critique AI. Management must clearly communicate the purpose, scope, and limits of AI applications and allow technologies to be adapted to organizational, employee, and cultural requirements. Only then can AI-driven change be implemented in a trustworthy way that fully leverages collective learning and human intelligence.

Sustainable organizational success requires more than technology. By fostering psychological safety and trust-based leadership, organizations unlock collective learning, innovation, and resilience – turning human intelligence into a lasting advantage.

Our thanks to Isabelle Hau and Dr. Meike Wiemann-Hügler for their insights on this increasingly important topic. It's clear that, for both individuals and organizations, innovating learning by adapting scope and empowering everyone is an essential opportunity.

Let's relearn how to learn!

[1] [2]

[1] https://acceleratelearning.stanford.edu/app/uploads/2025/12/Future-Ready-Voices-Brochure_SAL.pdf
[2] https://psychsafety.com/the-four-stages-of-psychological-safety/

ARCHITECTURE ANSWERS THE SKILLS SHORTAGE AND DEMOGRAPHICS

The shortage of skilled workers in the energy sector is not a temporary dip but, rather, a structural reality. Grids are being expanded, substations modernized, and renewable energy sources integrated. Meanwhile, experienced experts are retiring and only a limited number of young people and trainees are coming up through the ranks. To combat this trend effectively – and for the long term – businesses are turning to new solutions such as virtualization and software-centricity.

Many strategies today focus on recruiting, training initiatives, or external service providers. These are important but they are not enough to solve the skills shortage. The key question remains: How can we design technology and organizations so that we need fewer specialists while building and operating more infrastructure?

One important answer lies in the strict decoupling of function and hardware. Traditional system architectures are device-centric. In other words, many individual components perform their own clearly defined tasks. They are designed and configured individually and then maintained separately for years. Under this labor-inten-

sive model, knowledge is closely tied to specific devices, firmware versions, and manufacturer-specific tools. As a result, scaling almost always calls for a linear scaling of personnel.

DECOUPLING FROM HARDWARE

A software-centric approach reverses this logic. Functions for protection, control, monitoring, and analysis are run as flexible software modules on shared platforms. Physical devices in the field are reduced to mainly connecting to the primary equipment – that is, converting physical data into digital quantities – while logic, evaluation, and coordination take place in central, standardized runtime environments. Technically, this represents an architectural shift. Organizationally, it provides a solution to the skills shortage.

One additional and often underestimated aspect is the availability of the hardware itself. Global supply bottlenecks repeatedly demonstrate that specialized devices are not always readily available in the required quantities "off the shelf." In highly hardware-oriented, decentralized architectures, this can become a project or modernization risk because functions are inextricably linked to specific physical components.

These classic concepts no doubt have their place, not least because of their clear distribution and their elimination of a single, central point of failure. At the same time, it's worth looking to the world of IT, where uptime and stability have been addressed for years through redundancy, virtualization, and the rapid switching to available resources in case of failure. Functions are no longer rigidly tied to a single device but can continue running on other hosts. Applying this principle to energy automation creates an additional layer of resilience that not only cushions technical failures but also mitigates procurement risks because standard hardware and flexible platforms can better compensate for bottlenecks in individual specialized components.

EQUIPPED TO MEET FUTURE REQUIREMENTS

First, a platform strategy enables the true industrialization of engineering. When projects are no longer created as a collection of individual device configurations but, rather, from reusable models, templates, and standardized function libraries, the proportion of handcrafted, one-off solutions decreases. Engineering becomes a more configurable process. Knowledge is less concentrated in personal notes or implicit experience and more in structured, versioned artifacts. This makes teams more productive and reduces dependence on individual key personnel.

Second, scalability improves dramatically. Network infrastructure expansion today follows exponential rather than linear patterns. If every new system requires the same high proportion of manual device configuration and individual testing, bottlenecks are inevitable. Platform-based architectures allow for greater standardization and automation of commissioning, testing, and modifications. This enables a team to manage more projects in parallel without compromising quality or safety. The limiting factor shifts from device operation to architecture, standards, and processes.

Third, the skill set is changing for the better. The classic security specialist with in-depth knowledge of individual device types remains important but is no longer the sole bottleneck. Platform operations, virtualization, networks, cybersecurity, and software engineering are gaining in importance. This opens up the field to profiles that are already more widely available in other industries. IT and OT are converging. For many young engineers, a software-defined, data-driven environment is more attractive than purely device-centric work. Architecture is, thus, also becoming a tool for attracting talent.

CHANGING JOB PROFILES

In the past, working with a screwdriver was commonplace in protection system engineering. Today, the next generation reaches intuitively for a laptop. This observation reflects more than simply nostalgia. It describes the real transformation of the profession from heavily hardware-oriented, on-site work to software-based, model-driven, and networked activities. Instead of manually wiring and locally configuring individual devices, many tasks are moving towards configuration, simulation, data analysis, and remote access to central systems. Those who align architecture and tools accordingly are actively supporting this trend, as the barrier to entry falls for digitally savvy engineering, learning curves shorten, and work becomes more location independent. The laptop doesn't replace technical know-how, but it is becoming the main tool for a new generation that increasingly thinks of complex energy infrastructure as a software and systems landscape.

Fourth, the ongoing maintenance effort required for each system decreases. Every infrastructure built today generates decades of maintenance work. If changes, updates, or expansions have to be carried out on many distributed individual devices, this ties up personnel indefinitely. Central platform mechanisms, unified user management, standardized update processes, and consistent security concepts consolidate these tasks. Activities become more repeatable, better documented, and partially automated. The result is not less responsibility, but less operational friction.

Fifth, this approach helps in dealing with demographic change. Many organizations will lose a great deal of experiential knowledge in the coming years. A more model-based, standardized, and software-driven world necessitates the explicit mapping of logics, structures, and processes. This reduces implicit, person-specific knowledge. New employees can become productive more quickly because they navigate platforms and clear structures instead of laboriously working their way through heterogeneous combinations of devices.

REIMAGINING ARCHITECTURE, RELIEVING SKILLED WORKERS

Of course, the path to this goal is challenging. Transition phases with mixed architectures initially increase complexity. Redundancy, uptime, and security must be guaranteed in the new models to the same level or better. Organizationally, investments in further training, new role models, and closer collaboration between traditional system engineers and IT specialists are essential. But that is precisely the strategic point: The shortage of skilled workers is forcing this transformation. Those who consciously are investing now in platforms, standards, and software-defined architectures are trading a short-term increase in workload for long-term structural relief.

The important thing here is to shift the discourse away from the question of how we can do more and more of the same old things with fewer and fewer people, and towards the question of how we can design systems so that they require less highly specialized individual work from the outset. Software-centric, virtualized, and standardized architectures are not an end in themselves. They are a strategic tool for the secure further development of critical infrastructure under conditions of scarce resources.

The skills shortage isn't going away but we can decide whether it holds us back permanently or becomes a catalyst for a new, scalable way of planning, building, and operating energy infrastructure. Organizations that understand architecture as a human resources strategy will ultimately achieve more than those that simply try to find the same profiles in a depleted market.

JÜRGEN RESCH
Director Industry Management Energy

Jürgen Resch has been passionate about power plants and captivated by cables since he was a child. If you want to test out his expertise and find out just how switched on he is, simply email:

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WHEN ALBERT LEAVES, WILL AI STAY?

Albert has worked at the same company for 40 years and he knows how to operate the legacy equipment and keep it running. He also knows the old PLC code. When Albert retires, the company stands to lose a wealth of knowledge. At the same time, digitalization, energy demands, and cyber risks continue to push manufacturing into the future. Looking ahead, companies can use AI and human-centric technologies to safeguard their knowledge and make their processes more resilient. However, unless deployed properly, AI can bring new risks.

THE AI DILEMMA

The rise of AI-powered tools is automating many jobs, especially entry-level jobs, making many of these positions obsolete.[1] At the same time, companies report there is a shortage of skilled labor. Experts are in short supply and senior-level positions remain unfilled. Although AI is vital to productivity and to overcoming the lack of skilled workers, many companies are not yet using it effectively.[2] The market for AI is growing rapidly but the technology is spreading unevenly globally and this disparity is widening the gap between first movers and latecomers.[3] Agentic AI, for example, has so far been implemented only in a handful of pilot projects by technology leaders in manufacturing.[4]

Falling behind in technology, exacerbated by the challenge of unfilled vacancies, can lead to longer downtime, batch errors, and inadequate infrastructure monitoring, leading to higher energy costs and additional production issues.

[1] Is AI closing the door on entry-level job opportunities? | World Economic Forum
[2] AI has the capability to cut forecasting errors by 50% and reduce downtime losses by up to 50% AI in the Manufacturing Statistics 2025
[3] According to x, the market for AI in manufacturing companies was approximately USD 5.9 billion in 2024, with the potential to grow to USD 230.9 billion by 2034. .
[4] Digital Maturity Manufacturing Report: Benchmarks for 2024

CURRENT EMPLOYEES FILL THE GAPS

To fill the gaps, remaining employees have to do more. In addition to their core duties, process engineers, maintenance staff, and laboratory and production personnel, for example, now have to manage systems outside their specific fields of expertise and interpret data across a multitude of disciplines. Employees have to build up their know-how in automation, IT, and cybersecurity in order to keep pace with the increasing complexity of doing their job effectively.

Required information needs to be compiled from multiple sources, including building management systems (BMS), energy management systems (EMS), utility systems, and production lines. However, this information is often incomplete, misleading, or entirely inaccessible.

Although companies are investing to centralize systems and provide better access to data, employees often face a fragmented tool landscape and are forced to process data manually.[5] In addition, legacy systems and hardware are sometimes not integrated at all, either because the systems do not support open-standard protocols or because they are incompatible with the central system. As a result, these systems remain black boxes.

How can companies break this cycle? The answer is not to hire more staff – especially given today's short-term staffing constraints. Instead, the solution calls for technology that can multiply the capabilities of existing employees: systems that capture knowledge, reduce complexity, and empower less-experienced staff to work at an expert level. The key to this is a seamless, integrated platform.

> "Technology can fill gaps to reduce the workload on staff in production, the laboratory, and infrastructure."

Workloads can be reduced in virtually all areas, including in production, laboratories, and infrastructure, by allowing technology to fill the existing gaps. A prerequisite for this is the consolidation of data and tools in a centralized main system that spans multiple disciplines. As a software platform, zenon covers production processes as well as BMS, EMS, and utilities (e.g. compressed air, boilers/steam, cooling water, and water treatment), thereby reducing the need for separate specialized systems. Legacy systems and third-party applications can be integrated via numerous drivers, gateways, and APIs. A centralized user interface enables small teams to perform remote monitoring and control, using the native Service Engine, Web Visualization Service, and Web Engine.

The Automation Integration Layer and Historian360 integrate legacy and MES data, transmitting the information to IT and cloud systems via IIoT Services. This facilitates connectivity to AI and establishes the foundation for predictive maintenance, forecasting, and assistance systems. As a result, redundant tasks such as data entry and manual comparisons are eliminated.

Automatic contextualization, such as equipment models, alarm classes and groups, as well as data preprocessing and cleansing via zenon Logic calculations or hysteresis, facilitates the interpretation of relationships. This enables users to make better decisions more quickly - without having to ask Albert!

Alongside the centralizing of systems and logging of data, a human-centered approach is essential. Intuitive dashboards and guided workflows can reduce the cognitive load on personnel, enabling even less experienced staff to operate production facilities, buildings, and laboratories at a near-expert level.

zenon Dashboard Service proves useful in this regard. It aggregates KPIs, such as cooling or heating degree days, across multiple locations, whether you are on site or on the go. Thanks to the contextualization provided, alarm management is also significantly clearer for end users. Actions triggered by limit-value violations or events from external AI systems, as well as automated calibrations, enable proactive intervention and minimize user error. Message Control delivers alarms, events, and calls to action directly to the personnel currently on duty or on standby. Automatically generated trends and reports help further, for example, to detect compressed air leaks and monitor batch quality.

LESS WORK FOR SMALL ENGINEERING TEAMS

It is not only production staff, lab technicians, or maintenance personnel who face increasing complexity. To become AI-capable, systems must be modernized, integrated, validated, and maintained. As a consequence, small engineering teams are taking on additional duties, including OT/IT convergence, architecture development, cybersecurity, data modeling, and validation. The following measures help to reduce the workload:

- **Standardization of best practices:** Pre-built function blocks and libraries, such as Smart Object Templates in zenon, enable senior engineers to provide tested templates for drives, valves, dosing units, or supply systems. Junior engineers can then deploy these with minimal adjustments. Standardized UI design guidelines can be managed centrally via color palettes, style groups, and symbols. Base and template projects from the zenon Engineering Store accelerate rollouts.
- **Modularity:** With vendor-neutral Plug & Produce concepts, such as MTP and OpenDCS, and flexible project architectures, the same small team can transfer components to similar equipment or sites. This avoids custom solutions and reduces the need for expert resources.
- **No-code/low-code:** The principle of "configuring instead of programming" shifts the focus of work activities to setting parameters and orchestration.

[5] 90% of top machine manufacturers are investing in predictive analytics technology

This principle was the foundational concept behind zenon and is deeply embedded in the software platform's DNA.

– **Virtualization and open standards:** Virtualized SCADA systems, controllers, and edge devices enhance flexibility, scalability, and maintainability. Linux-based controllers can be operated using zenon Service Engine and Logic or they can be virtualized entirely. The Device Management element of IIoT Services further enables centralized deployment across multiple devices and locations.

ON THE FAST TRACK TO EXPERTISE WITH AI

How can you become an expert without ever starting out or gaining any experience?

Companies that use AI just to cut costs risk facing a shortage of experienced professionals in the future because they are not developing the next generation of talent.[6] Technology leaders should combine human-centered automation, workforce development, and AI-powered solutions to set themselves apart from the competition.[7]

Entry-level positions remain necessary but must be reimagined – for example, as technology copilots. Typical tasks include reviewing AI-generated project templates and code, virtual commissioning, scenario testing, and what-if analyses using digital twins.

Even though technology is partially filling staffing gaps, we continue to need a human in the loop because, in hazardous industrial environments, only humans can provide context, ethical judgment, resilience, and accountability. Ultimately, the human factor remains irreplaceable. And, with Albert's retirement approaching, knowledge transfer becomes a matter of urgency – so that his undocumented practical knowledge is not lost. Human-centric technology can safeguard this knowledge and expertise, reducing workloads for employees and preserving business know-how for the future.

The labor market is going through a transition. Technology can support your employees in a variety of ways:

– **Central integration:** Platforms such as zenon bundle together production, BMS, EMS, and utilities. With more than 300 drivers, gateways, and APIs, zenon enables vendor-independent connectivity and eliminates the black boxes of legacy equipment.
– **Data- and AI-readiness:** zenon Automation Integration Layer, Historian360, and IIoT Services ensure clean, contextualized data and form the foundation for predictive maintenance, forecasting, and assistance systems.
– **User-centric systems:** With intuitive dashboards, intelligent alarm handling, message control, and guided workflows, user-centric systems reduce cognitive load and enable even less-experienced users to operate the system safely.
– **Reduce workloads on smaller engineering teams:** Standardized Smart Object templates, modularity, no-code/low-code approaches, as well as virtualization and open standards, minimize recurring tasks and reliance on experts.
– **Young talent & accountability:** New, entry-level hires become technology copilots, supporting knowledge transfer and building expertise. That's important for succession planning and because human accountability remains indispensable.

ANITA PERCHERMEIER
Director Plant Infrastructure

Anita Perchermeier has been with COPA DATA since 2014. As Director of Plant Infrastructure Manufacturing, she supports the development of zenon solutions so that production facilities and building automation not only run reliably but are operated more intelligently and sustainably. As a hobby gardener, she tends her personal "plant infrastructure" and gets new ideas while running.

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[6] AI jobs danger: Sleepwalking into a white-collar bloodbath
[7] Digital Maturity Manufacturing Report: Benchmarks for 2024

THE PHARMACEUTICAL INDUSTRY IS FACING A SHORTAGE OF SKILLED WORKERS, making efficient processes increasingly important. Meribel Pharma Parets demonstrates how digitalization can assist: By implementing paperless workflows and consolidating data on a digital platform, batch release times were reduced from eleven days to just two. The advantages: Electronic batch records reduce errors, create transparency, and relieve the burden on employees. This leaves more time for valuable tasks, production runs faster, compliance improves, and the company becomes more attractive as an employer – a clear example of how digital solutions can mitigate the shortage of skilled workers.

MERIBEL PHARMA PARETS DIGITALIZES BATCH RECORDS

Meribel Pharma Solutions is a contract development and manufacturing organization (CDMO), providing drug development and pharmaceutical manufacturing services to pharmaceutical and biotech companies. Prioritizing innovation, the highest quality standards, employee experience, and talent attraction, Meribel recently launched a digitalization program at its Parets manufacturing location in Spain. System integrator Appliant, a COPA-DATA Gold Partner, deployed the zenon software platform to digitalize Meribel's batch records, improve quality, and simplify compliance reporting.

CHOOSING ZENON TO DIGITALIZE BATCH RECORDS

Founded in 2024, Meribel has 11 sites across the EU, including both drug development sites and manufacturing facilities spread across France, Spain, and Sweden. Meribel's Parets site, just outside Barcelona, offers multi-functional pharmaceutical manufacturing capabilities within an 11,900 m2 footprint. As well as supporting a wide range of dosage forms, including solids, semi-solids, and non-sterile liquids, it offers advanced solutions for specialized packaging. The site is also certified to manufacture clinical trial and veterinary products. It holds cGMP, ISO 13485, ISO 14001, and ISO 45001 certifications, underwriting its reliable, compliant production.

The eBR has embedded a Review & Approval process for batch release according to its authoritzation workflow and connected to the Active Directory.

The CDMO is committed to ensure the safety of the medicines it produces for its customers, with rigorous quality assurance measures and unwavering adherence to GMP standards, ensuring products are manufactured with the utmost care and precision. Until recently, the collection of shopfloor batch data and the release of batch records at Parets had relied on manual systems. This meant a batch release process could take up to eleven days.

Meribel wanted to improve these manual processes, making them more accurate, more reliable, and faster through digitalization. Teia Forcat, Operations Director at Meribel Parets, explains, "We want our digital transformation to improve the accessibility of data, reporting, and continuous improvement. We also know that, by taking a lead on digitalization and innovation, we can attract and retain the best talent, especially new talent from younger generations."

MERIBEL PRIORITIZES DIGITALIZATION AND INNOVATION

Meribel opted to work with Barcelona-based Appliant, a system integrator that specializes in empowering customers through the digitalization of production processes and plants. Its manufacturing intelligence platform (MIP) for the pharmaceutical industry is based on the zenon software platform from COPA-DATA.

Meribel's digitalization initiatives at the Parets location were hindered by heterogeneous machinery on the shopfloor, isolated data silos, and manual data collection processes. In particular, the batch records involved a lot of manual work. Each manufacturing room had its own documentation and procedures. This was non-efficient and entailed a strong reliance on manual processes. Additionally, the lack of available process data reduced the team's capacity to perform root-cause analysis of any deviation or corrective actions preventive actions (CAPA) execution.

"We needed one simple platform for all our data that didn't rely on paper so we could gain real-time visibility of our operations and ensure data integrity and compliance everywhere," says Teia Forcat. "We chose zenon to give us this platform."

APPLIANT RECOMMENDS ZENON FOR "PAPER ON GLASS" SOLUTION

Appliant began by working with Meribel's quality and manufacturing teams to create a digital, tablet-based solution that could replace the slow, manual, paper-based processes. The input of the final users in shaping zenon's graphical user interface was an important success factor.

"zenon is the perfect solution here because it offers enough flexibility to adapt the Paper-on-Glass (PoG) tool to daily operations, smoothing the transition to a digital solution with a similar look and feel to the paper-based standard operating processes," explains Marc Ramoneda, CEO at Appliant.

To create the solution for Meribel, Appliant leveraged zenon's PoG, Recipe Group Manager, Historian, Reports, Message Control and Extended Trend modules. These native capabilities, when paired with zenon's unparalleled connectivity with shopfloor systems, meant the solution could be delivered quickly and with minimal

The MIP provides Meribel with real-time information of any process step in any cleanroom – from anywhere.

engineering effort. Customizations were possible, using zenon's integrated Logic and support for Add-Ins, but were kept to a minimum thanks to zenon's wide-ranging, sector-specific capabilities and the expertise of the Appliant team.

Marc Ramoneda explains, "Using zenon enables us to reduce engineering efforts and validation resources. For example, the GAMP 5 Category 4 compatibility of zenon reduces the validation workload, as the integrator handles much of the configuration and testing – allowing for a faster, more streamlined implementation."

DATA INTEGRITY AND MANUFACTURING OPTIMIZATION IS IMPROVED

The PoG batch records solution and new digital standard operating procedures (SOPs) have improved data integrity and connect data from across the site. Live monitoring of all processes is now possible. As well as reducing administrative effort, real-time monitoring helps the quality team to reduce waste.

Alba Nieto Conde, Production Compliance Officer at Meribel Parets, explains, "The new system makes our lives easier and reduces mistakes because each step is verified in real time. Furthermore, mistakes in batch records are trending to zero. The time we previously spent on revisions can now be redirected to more value-adding work."

If problems are found, they can be investigated quickly. Even six months after the fact, root-cause analysis can be carried out without difficulty. Operators, the quality team, and management now enjoy robust and rapid access to all relevant production data, thereby enhancing efficiency and transparency and making continuous improvement initiatives possible.

"zenon's scalability, adaptability, and connection to pre-existing systems make it easy for us to integrate different solutions – including supervisory control and data acquisition (SCADA), overall equipment effectiveness (OEE), and consumption – in the same MIP," asserts Marc Ramoneda. "Meribel can scale up different SOPs as needed. Having the data centralized in one system also gives the Meribel team new opportunities to exploit the data for different objectives."

IMPROVING THE SERVICE TO CUSTOMERS

Digitalization has enabled the Meribel Partes team to automate essential reporting requirements, such as standard deviation reports. The new electronic batch record (eBR) has replaced the old paper-based processes and eliminated related errors, such as missing entries or signatures.

Meribel can now review by exception using the eBR and, as a result, the batch release time has been reduced from eleven days to just two to three days. As well as improving efficiency for Meribel, these time savings make it possible for Meribel's customers to reduce their time to market.

In the longer term, now that data is accessible to everyone in the company with the right permissions, the quality of operational reports and annual product quality reports (PQRs) will improve. These reports will now be generated automatically, delivering further time savings and quality improvements for the Meribel team.

CONTINUING DIGITALIZATION PROGRESS

"I would recommend zenon for many reasons," says Teia Forcat. "Because it is a modular solution you can get started with it quickly and take an evolutionary, rather than a revolutionary, approach to rolling it out across the factory. zenon is easily acceptable to all teams and cost-efficient."

"COPA-DATA and Appliant have delivered a high-value service, accompanying us throughout the transformation process. Most importantly, zenon's native validated package (21 CFR Part 11 and GMP Annex 11 and more) makes it easy to implement the solution in pharmaceutical companies. With zenon, you can start small – and aim big!"

The company plans to continue to develop the solution. In the future, an increasing number of values will be retrieved directly from the machine or sensor, so that the operator does not need to enter values manually. Meribel will also use zenon to compare the manufactured product against the ideal, making real-time rejections possible.

Connection with HR systems to ensure operators have the right skills and training to operate a particular machine is another innovation under consideration. The team also plans to inlcude OEE tracking system into the platform.

Teia Forcat concludes, "I am obsessed with the future – and paper is not the future! We are now ready for what comes; we can attract and retain the best talent and all our people can be proud to work here."

Real time visibility of the status of current batches, scheduled batches, and previous batches.

AROUND THE WORLD

VISUALIZATION OF BAGGAGE HANDLING SYSTEMS FOR FRAPORT

Fraport AG is one of the world's leading airport operators. At Frankfurt Airport, a central aviation hub in Europe, one of the most complex baggage handling systems in the world ensures that millions of pieces of luggage every year are sorted and delivered accurately and efficiently. In order to meet this logistical challenge with state-of-the-art technology, Fraport has completed an end-to-end modernization of the visualization system using zenon from COPA-DATA.

With more than 61 million passengers per year, Frankfurt Airport is one of Europe's busiest international aviation hubs. This volume of passengers requires Fraport to operate one of the world's largest and most efficient baggage handling systems (BHS). It ensures that the airport's luggage moves smoothly.

The current BHS is approximately 81 km long and includes some 22,500 electrical drivers. When Terminal 3 opens, the system will increase to around 100 km in length and the number of drivers will grow to around 26,500. On peak days, more than 120,000 pieces of luggage are sorted and distributed automatically at a travel speed of 18 km/h. An outage in the BHS could have major repercussions for the entire airport, its operations, and its passengers.

OUTDATED SYSTEMS HAMPERED OPERATIONS

Before launching the project, the Baggage Control Center was working with three different software solutions to provide visualization, control the BHS, and display baggage carousels for arrivals. This fragmented approach led to significant extra work and high maintenance costs.

The analog MOSAIK display panels running legacy software were also a challenge for the team. Third-party providers were needed to make changes. This resulted in additional costs, longer lead times, and a lack of flexibility. In addition, the physical scalability of the MOSAIK interface had reached its limit. When new terminal areas went live, such as Gate A-Plus, the new system components could not be displayed.

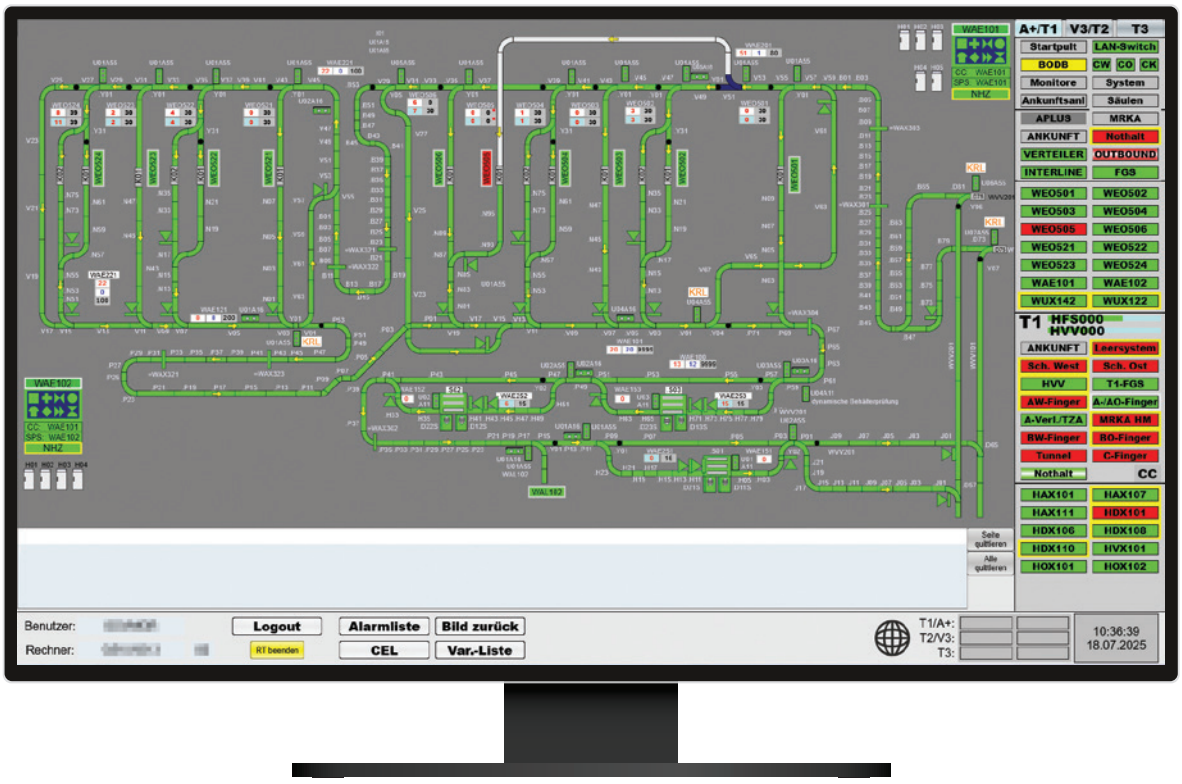
With ongoing modernization activities and additions to the BHS, Fraport regularly needed to make changes to the visualization and control systems. The legacy systems were too inflexible to support these necessary changes easily. Considerable work was required to meet requirements.

ZENON PROVIDES NEW CENTRALIZED VISUALIZATION PLATFORM

To attain the necessary agility and scalability, the Fraport team wanted to transfer all sub-areas of the BHS to a centralized visualization system. After thorough evaluation, Fraport chose zenon – the modular, scalable platform from COPA-DATA. zenon's open architecture and wide range of standard functions impressed the airport operator.

The project was implemented successfully with 61 structured sub-projects. It currently includes more than 1.37 million tags and around 680 programmable logic controllers (PLCs). System communication is supported by approximately 160 drivers. The majority of functions could be implemented using standard zenon functions. More complex requirements, such as special process logic, were implemented using add-ins and the programming interface (API) in C#.

> "With zenon, we have found a flexible and powerful platform that enables us to make adjustments independently and respond quickly to operational requirements. Not having to rely on third-party service providers saves costs and gives us the control we need over our systems."



The first gate in Terminal 1 visualized with zenon, including incoming and outgoing conveyor lines and collection points.

"Dr. Matthias Oertel from our system integrator partner Helix supported us in implementing additional programming. Even during peak times, we could count on the Helix team to support with project planning," says Alex Fuchs, FGS Research and Industrial Initiative Engineer at Fraport.

Sebastian Spitzbart, fellow FGS Research and Industrial Initiative Engineer at Fraport, adds, "Thanks to zenon's wide range of functions, such as its numerous available drivers and a flexible programming interface, we can customize the system to closely meet our unique requirements and integrate it optimally in our existing infrastructure. This has also allowed us to respond to feedback from operating personnel in the Baggage Control Center to customize the visualization system to better meet their needs."

GO LIVE ACHIEVED DURING NORMAL OPERATIONS

In an airport, where infrastructure runs around the clock, undertaking modernization projects during live operations is extremely challenging and requires precise planning and close coordination between all stakeholders.

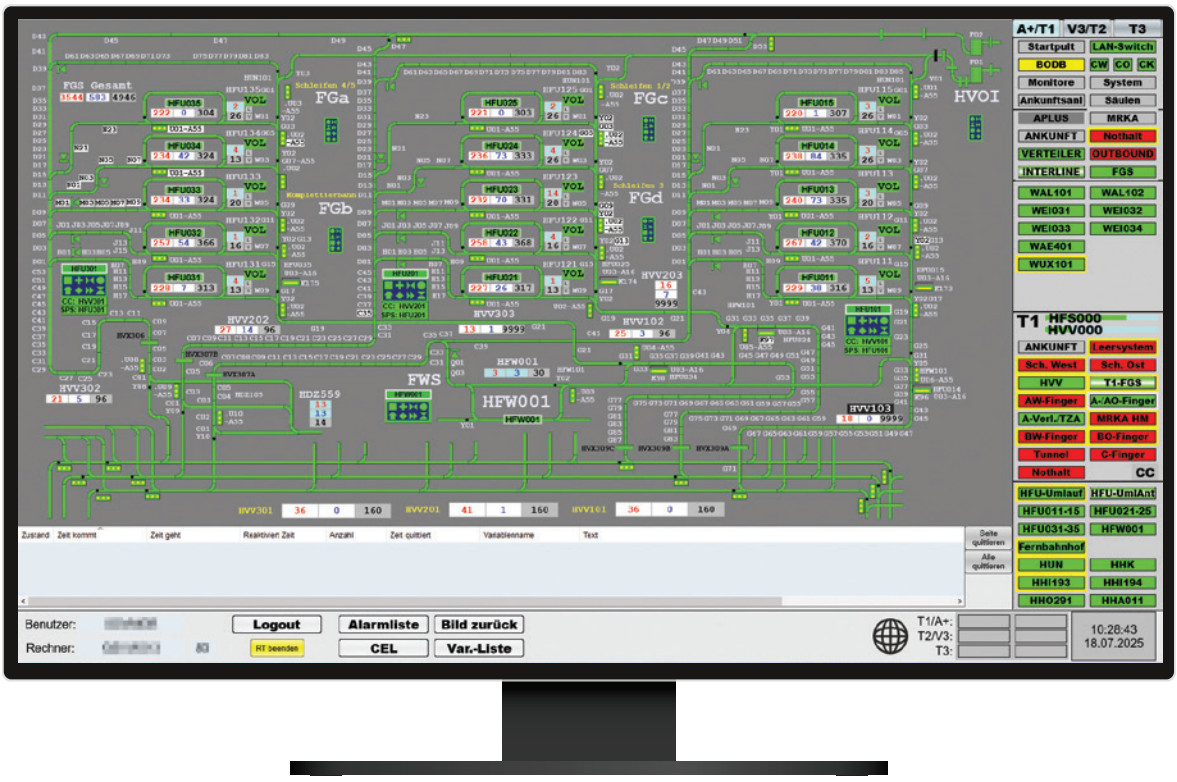
It was vital to transition to the new system seamlessly without disrupting daily airport operations. To achieve this, the zenon-based visualization system was initially set up in parallel with the legacy system. It was then tested extensively. Only when all the functions were running error-free did the team finally decommission the wall of legacy MOSAIK systems.

Since then, the visualization has been running on state-of-the-art 86-inch and 42-inch monitors on a video wall in the Baggage Control Center, as well as on 16 operator workstations, each equipped with three monitors.

MORE CONTROL, FEWER EXPENSES, GREATER EFFICIENCY

By switching to zenon, Fraport was able to centralize its entire BHS and significantly improve the system's operating efficiency. It is now possible to adjust visualizations or system structures inhouse. Fraport no longer relies on third-party service providers. This saves costs, accelerates project cycles, and reduces response times in the event of a breakdown. System scalability is also enhanced. It will now be much easier to add new terminal areas.

A major advantage of the new solution is that it improves operational monitoring thanks to all the status and process information provided by zenon. zenon makes it easy to quickly detect and troubleshoot sources of error.



Dynamic early baggage storage system in Terminal 1, consisting of 15 separate storage loops and a higher-level circulation loop to provide baggage buffering on a demand-driven basis.

"This project has modernized and streamlined the system landscape significantly. zenon has enabled us to replace the previous fragmented, multi-system approach with a centralized, end-to-end solution," says Sebastian Spitzbart.

Alex Fuchs adds, "The zenon platform is also highly scalable – and future functionality can be integrated seamlessly."

DOING MORE THAN PLANNED

Originally planned only as a solution for visualization, zenon is now much more than an HMI. Fraport's deployment of zenon enables users to control switches, activate scanning points, and monitor further components. The customer will also be able to integrate predictive maintenance concepts in the future. As a result, zenon is already doing much more than was set out in the original project scope. zenon provides the digital backbone for BHS monitoring and will provide BHS visualization for the new Terminal 3 when it is completed.

PROJECT HIGHLIGHTS

System details and benefits at a glance:

- Centralized, standardized visualization of all parts of the system
- BHS spans approx. 81 km of baggage track
- When Terminal 3 opens, the BHS will grow to approx. 100 km
- Project scope: 1.37 million tags, 61 subprojects, 160 drivers, 680 PLCs
- High level of flexibility in terms of scaling and modernization
- Independence from third-party service providers
- Considerably lower maintenance costs
- Rapid response in the event of malfunction or change requests
- Highly customizable to meet the needs of operating personnel
- Future-ready platform that is scalable and can accommodate new construction projects

OUR COMMITMENT TO EDUCATION: INSPIRING A PASSION FOR STEM

The shortage of skilled workers is stifling investment, development, and innovation – and it has major consequences for companies and entire regions. When businesses wait for shortages to impact them directly before taking steps to address these problems, it is usually already too late to fix them. Successful companies, on the other hand, take proactive steps on an ongoing basis. COPA-DATA has long been committed to education. It is part of our corporate culture, where we value one thing above all else: people empowerment.

EDUCATION IS A LONG-TERM INVESTMENT

We have long made it a priority at COPA-DATA to foster young talent and to support continued education. We consider it both our corporate responsibility and a social responsibility to do our part in training and developing the skilled workers of the future. A look at current demographic trends, specifically the marked decline in working-age population projected for the coming decades, reveals that far-sighted measures are essential. A commitment to education is a long-term investment that often takes years to yield returns. Yet when it does, it provides a decisive competitive advantage.

As a software manufacturer, we are especially committed to the STEM fields of science, technology, engineering, and mathematics. First, because our professional roots lie in these areas and we need qualified specialists. Second, because there is a significant shortage of talent, particularly in these future-oriented sectors. We partner with educational institutions, as well as extracurricular initiatives, primarily in the greater Salzburg area where our corporate headquarters is located. A strong center for IT operations calls for well-trained talent and it is, therefore, close to our hearts to strengthen the Salzburg region as a leader in information and communication technology.

SELF-CONFIDENCE AS A KEY FACTOR IN EDUCATION

Interests and preferences emerge early, often as early as kindergarten. When these aptitudes are recognized and supported, they can lay the foundation for future educational and career paths. The preconditions for this are the ability to come into contact with a range of topics and being allowed to explore and experiment without any pressure or judgment. Initially, this experience can take the form of play. Later, it can be shaped by the interaction of theory and practice.

Alongside the transmission of knowledge, environment is also crucial. Anxieties, insecurities, or excessive caution can stifle curiosity. Placing trust in children and adolescents, encouraging them, and viewing mistakes not simply as opportunities but as essential to learning can strengthen an often-underestimated factor: self-confidence. Those who learn early on that failure is an integral part of the learning process are better equipped to navigate future challenges, transformations, and problem-solving with greater confidence.

At a time when the internet, combined with artificial intelligence (AI), is putting knowledge at our fingertips 24/7, more profoundly human skills are gaining relevance, including communication and collaboration skills, creativity, critical thinking, problem-solving expertise, empathy, and curiosity – a pioneering spirit rather than imitation and reproduction. These skills often matter more than strictly specialized knowledge. As a result, education means more to us than acquiring knowledge. It also includes personal development. Relationships and empowerment lie at the heart of our partnerships.

At the annual COPA-DATA Open House Day, HTL students get a backstage pass and firsthand experience at an international software business.

PARTNERING WITH LOCAL EDUCATIONAL INSTITUTIONS

We partner closely with the Higher Technical Colleges (HTLs)[1] in Salzburg, Hallein, and Braunau, and serve on their boards of trustees. In addition to providing financial support, we play an active role in developing their educational programs, equipment, and infrastructure to ensure a strong focus on practice. This can range from purchasing individual pieces of equipment to setting up entire laboratories and learning environments. It extends to providing free zenon software licenses for educational purposes, including training for teaching staff. Students have the chance to complete four-week internships with us during the summer. For those interested, we also provide guidance and support for their thesis during their final-year project. Once a year, we invite around 90 HTL students to our headquarters for an Open House Day, where they can learn about our projects, our corporate culture, and everyday work life at COPA-DATA.

For almost 25 years, we have also partnered closely with the Salzburg University of Applied Sciences (FH Salzburg), specifically with the Department of Information Technologies and Digitalization. We focus mainly on the sharing of knowledge and technology between academia, research, and product development. As an educational partner and member of the IT Support Association, we support initiatives designed to provide practical training. For example, students fulfill their internship requirements with us and we also supervise bachelor's and master's theses. In addition, as one of three corporate partners, we are actively involved in the Josef Ressel Center for Intelligent and Secure Industrial Automation, where research is conducted on digital assistance systems for industrial machinery. This close bond is also reflected in our workforce: Approximately 50 of our employees are alumni or current students of FH Salzburg. They represent about one-fifth of the staff at COPA-DATA headquarters.

We recently strengthened our partnership with the University of Salzburg, specifically with the Faculty of Digital and Analytical Sciences. COPA-DATA employees give lectures, support projects, and advise students working on their theses. In the field of research, we partner with Intelligent Data Analytics (IDA) Lab Salzburg, which is currently developing predictive models for sustainable industrial energy management.

PARTNERING WITH EXTRACURRICULAR ORGANIZATIONS AND ASSOCIATIONS

In addition to traditional paths of education, COPA-DATA also currently supports three special initiatives in the STEM sector: Hacker School Austria, EUREGIO Girls' Day, and Gemini Salzburg.

Hacker School Austria provides low-threshold access to digital education through German-language programming and AI courses for school classes, either onsite or online. IT professionals teach the fundamentals of MakeCode, HTML & CSS, and Python. COPA-DA-

[1] HTLs (Higher Technical Colleges) offer a five-year program in the Austrian education system that focuses on technology and vocational training. The curriculum combines theory with hands-on training in workshops and laboratories and culminates in a final diploma exam.

TA employees also volunteer their time as "inspirers" whose role is to inspire young people between the ages of 11 and 18 to take up programming.

Every year at EUREGIO Girls' Day, we invite girls from Salzburg and nearby regions to learn in a hands-on way about the profession of software developer, free from clichés and prejudice, and with excellent prospects for the future.

Using modern workshops, Gemini Salzburg creates a future-oriented learning environment for young people, apprentices, and skilled professionals. In addition to courses covering fields such as robotics, automation, CNC technology, and electrical engineering, the STEM-inspired Gemini-mobile tours the region as a traveling maker space. As a main sponsor, COPA-DATA supports the infrastructure of this project, enabling flexible access to technical training. In addition, our apprentices benefit from supplemental courses tailored to the skilled trade of Application Development and Coding.

OUR MOTTO: STAY CURIOUS!

Skilled professionals do not suddenly appear out of thin air. Behind each skilled worker, you will find motivation, opportunities, decisions, and mentors along the way. COPA-DATA sees itself as just such a mentor – ideally, as a forerunner. It's why we remain committed to inspiring people to engage with STEM and, in the spirit of lifelong learning, encouraging them to stay curious.

JULIA ANGERER
Relationship Manager –
Education & Research Institutions

From 2009 to 2019, Julia Angerer shaped COPA-DATA's communication and branding. In her new role, which she has held for several years now, she develops relationships with individuals at educational and research institutions across the greater Salzburg region. She creates synergies, builds bridges and networks, and serves as a contact person and liaison for all the stakeholders involved.

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#StayCurious

WHAT MOTIVATES OUR COMMITMENT TO EDUCATION

Professional development and quality assurance
Simply put, nothing works without people! The best solutions require the best minds or those aspiring to become them. No one is born a professional, yet everyone possesses innate talents that are waiting to be discovered and developed. We view people empowerment as a unique investment in fostering purpose and quality.

Training and knowledge transfer
One never stops learning in life and shared knowledge has the potential to do great things.Every opportunity to share knowledge and experience can offer fresh insights and lead to important changes in perspective. We don't want to rest on our laurels and we also don't want to grow just for the sake of growth. Rather, we aim to drive things forward and make a real impact – together.

Research and development
We have a constant thirst for the new and we enjoy keeping one step ahead. Within all of us lies an explorer's nature and the urge to find answers to open questions. For us, a commitment to education means nurturing this inner explorer and providing the framework needed to experiment and take voyages of discovery.

Fostering young talent and strengthening operations
Future generations are close to our hearts and we value our roots.Without the fresh breeze brought by new generations, one quickly runs the risk of becoming insular and this inevitably leadsto stagnation. Today's newbies are tomorrow's skilled workers. This makes them truly valuable and deserving of both time and attention.

2025 PARTNER AWARDS: SPOTLIGHT ON SYSTEM-INTEGRATORS

The COPA-DATA Partner Awards made their debut at zenonIZE 25 as one of the program's highlights, celebrating technology, team spirit, and outstanding achievement. The best integrators presented impressive scalable and sustainable solutions for energy infrastructure and manufacturing. We share the highlights about what makes these projects truly inspiring.

With its Partner Awards, COPA-DATA aims to make a clear statement: Integrators are more than just implementers – they are drivers of digitalization and are actively shaping the future for customers. At the first awards ceremony, the jury presented the audience with an impressive range of projects that combine technology with genuine customer benefits while also promoting sustainability.

THE WINNERS IN THE ENERGY SECTOR

In the Energy & Critical Infrastructure category, the jury – consisting of five members from COPA-DATA's Industry Management, Support, and Key Account Management team – found it particularly difficult to select a winner. The winner, SPIE Energotest from Poland, impressed with its ECONTROLoze project, a scalable energy management system for renewable energy equipment. The winning solution enables the remote monitoring, control, and optimization of a wide variety of renewable assets and integrates weather forecasts and market data to ensure efficient operation under varying conditions. The project demonstrates how zenon is driving forward the energy transition through centralized portfolio management and the flexible automation of hybrid energy systems – tailored to meet user needs.

ECONTROLoze is a digital platform for managing renewable energy equipment that integrates a range of installations and energy systems. It features generation forecasts, market-driven automation, continuous asset monitoring, and simplified operation. The solution also increases efficiency, reduces operating costs, supports flexible scaling, and allows for rapid responses to (regulatory) market changes.

Michał Zając of SPIE Energotest from Poland impressed the jury with his project ECONTROLoze, a scalable energy management system for renewable energy plants.

Second place for PROTASIS

The Hybrid System for Electricity and Heat Production from Renewable Energy Sources (RES) project on the Greek island of Agios Efstratios, implemented by GEK TERNA, combines a 0.9MW wind turbine, a 0.2MW photovoltaic system, a 2.56MWh battery storage system, and 1,005HW district heating network. It meets more than 85 percent of the island's electricity demand and also controls the existing diesel power plant. The system utilizes zenon Energy Edition (up to 1,500 data tags), including a smart server for data exchange and an HTML web engine for browser-based monitoring and control. Smart objects and integrated IEC 61131 logic blocks significantly reduce the amount of custom code.

Key platform components include the Service Engine for SCADA runtime and visualization, zenon Logic for automation routines, and native communication protocols (including IEC 61850 and Modbus) for full interoperability. Custom visualization templates and symbol libraries ensure a standardized graphical representation of isolating, disconnecting, and earthing switches.

NIDEC Conversion takes third place

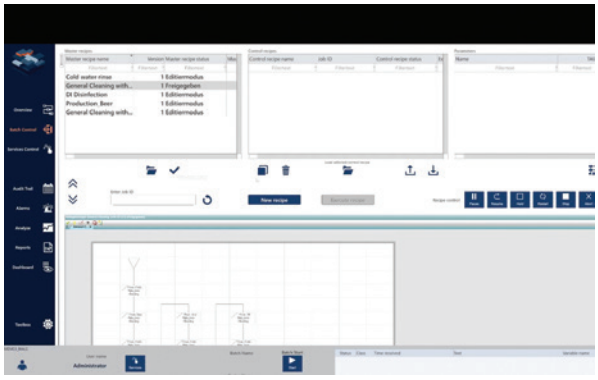
A project from Italy that involves the automation of several ports in Sardinia won third place. It included the planning, electrical and automation engineering, and commissioning of land-side power (cold ironing) systems in Cagliari, Olbia, Golfo Aranci, Santa Teresa Gallura, Porto Torres, and Portovesme. The systems are controlled by a redundant zenon Energy Edition configuration with zenon Server and zenon Logic (including a soft PLC). The system is complemented by zenon Energy Clients, the Engineering Studio, communication protocols (IEC 60870-5-101/104), and a message control module. Safety is ensured by a PILZ SAFETY PLC, while additional auxiliary systems handle monitoring and diagnostics, including for transformer monitoring, ventilation, fire protection, and power quality.

THE WINNERS IN THE MANUFACTURING SECTOR

And in manufacturing? Memo3 (Switzerland) earned the gold medal. To meet the increasing demand for non-alcoholic beer, Memo3 implemented a modular dealcoholization system based on zenon with native MTP integration. Using a plug-and-produce approach, the winners created a flexible, scalable, and cost-efficient production system, deploying zenon as an OpenDCS. At the Rugenbräu brewery in Matten near Interlaken, centuries-old brewing tradition meets modern automation. With zenon 14 as the main system, the solution utilizes Profinet connectivity, a soft PLC on a Windows IPC, an integrated touch panel, and reusable engineering templates. This architecture reduced engineering and commissioning effort by up to 30 percent and delivered a market-ready solution just two weeks after commissioning.

Second place for Appliant

End customer Meribel Pharma Solutions chose to collaborate with Appliant, a specialized system integrator for the digitalization of production processes and sys-



tems. Appliant's Manufacturing Intelligence Platform (MIP) for the pharmaceutical industry is based on the zenon software platform.

Meribel's digitalization initiatives at its Parets site were hampered by a heterogeneous machinery landscape in production, isolated data silos, and manual data-entry processes. Batch documentation, in particular, required a significant amount of manual effort. Each production room had its own documentation and procedures, resulting in inefficiencies and heavy reliance on manual processes. Furthermore, the lack of available process data limited the team's ability to conduct root-cause analyses for non-conformance and to implement corrective and preventive measures. All of these challenges were successfully addressed with the zenon-based Methods Integration Process (MIP).

RETEL Neuhausen AG takes third place

Back to the world of modular production: The system integrator RETEL Neuhausen from Switzerland is using the MTP Gateway to integrate a steam sterilizer in an MTP-POL with zenon 14. The aim of the project was to establish MTP as the standard for process equipment at Belimed.

The project's biggest challenge was the complex MTP interface with its numerous objects that had to be transferred to the POL. A generator for the database-driven creation of MTP files, including visualization, now enables a significantly higher level of engineering efficiency. The MTP gateway gives Belimed a competitive advantage and opens up new customer potential. The structured S7 library and expert support from COPA-DATA further facilitated the project's implementation. As the importance of MTP continues to grow, RETEL plans to integrate the standard consistently in the future.

2027 PARTNER AWARDS

On October 5-6, 2027, the next Partner Awards will be presented at zenonIZE 27. The potential applications of zenon are as varied as the countries of origin in our partner community – there are virtually no limits to the creativity of integrators. We look forward to hearing about our members' new and innovative ideas.

Josef Trapl of Memo3 implemented a modular de-alcoholization plant based on zenon with native MTP integration.

Would you like to learn more? Watch the videos showcasing the projects from all the finalists – presented directly by the integrators.

OVERVIEW OF THE AWARD WINNERS

Energy & Critical Infrastructure

1st place: SPIE Energotest
2nd place: PROTASIS SA
3rd place: NIDEC Conversion

Manufacturing

1st place: Memo3
2nd place: Appliant
3rd place: RETEL Neuhausen AG

Got questions? Would you like to learn more about the Partner Community? Get in touch at **partner@copadata.com**. For additional information, visit **www.copadata.com/partner**

ABOUT US

In every issue, Information Unlimited places the spotlight on selected employees to help our readers get to know our company better. Our employees featured here talk about their professional workday and personal interests.

LAURA HARRINGER

Technical Account Engineer,
COPA-DATA Headquarters
At COPA-DATA since: 2018

I support projects and serve as the main technical contact person between clients and internal teams. I combine technical expertise with the client's business objectives to ensure solutions are implemented effectively and create long-term value.
Open communication, trust, and knowledge sharing are important to me. In my free time, you can find me sailing, lifting weights, cycling, and practicing yoga.
I enjoy the many different aspects of my work. Different topics and projects make every day exciting and spark my curiosity and desire to continuously learn new things. I align technical decisions proactively with client goals and support the team through mentoring. I also monitor implementations to ensure clients obtain sustainable, measurable benefits.

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ALEXANDER RESINGER

Expert Software Developer,
COPA-DATA Headquarters
At COPA-DATA since: 2008

My specialties are Report Engine and zenon IIoT Service, as well as web application development with .NET and Angular. I also have experience with Windows Presentation Foundation (WPF), relational databases, and MongoDB, as well as Kubernetes and Docker. Colleagues come to me for technical advice, performance optimization, and architectural questions.
In my free time, I like spending time with my two children, playing sports, exploring technology, and occasionally playing guitar. In 2025, I cofounded an association with some friends where we introduce children to programming, robotics, and other technologies through play.
I value daily challenges and continuous learning as part of a team. As a developer, I develop both software and myself. I create robust solutions, share knowledge, and mentor young talent to ensure the long-term growth of our team.

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BIRGIT PLAINER

Senior Global Event Manager,
COPA-DATA Headquarters
At COPA-DATA since: 2013

From concept and execution to logistics, I support our international teams and partners in planning and organizing events. I provide them with practical tips and help with troubleshooting. I also advise on trade fair stand and booth designs, adapt proven ideas, and assess feasibility and optimizations.
Respect, helpfulness, thinking outside the box, and honesty are important to me. Empathy and flexibility are some of my strengths. In my free time, I enjoy skiing, swimming, and ice baths. I love traveling with my family and attending concerts and the theater.
I particularly value cross-team collaboration and direct involvement in events. The combination of planning and quick, ad-hoc problem solving energizes me. I especially appreciate the opportunity to constantly try new things at my second family, COPA-DATA.

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MARKUS ARNOLD

Technical Director,
COPA-DATA Deutschland
At COPA-DATA since: 2018

I work across disciplines and have a broad range of practical knowledge. People come to me when they need someone who can do “a little bit of everything” – from conception to implementation. If I don’t have a specific answer, I know the person who does.
Clear and open communication is especially important to me in collaborations. Mistakes happen but, as long as we learn from them, it’s no problem. I rely on constructive feedback, short meetings, and mutual support to move projects forward efficiently.
In my free time, I enjoy hiking in the mountains. I also run, cycle, and am a passionate concert-goer. I like to share my knowledge and to find pragmatic solutions as a team.

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