Immersed Computing

COOL TECHNOLOGY

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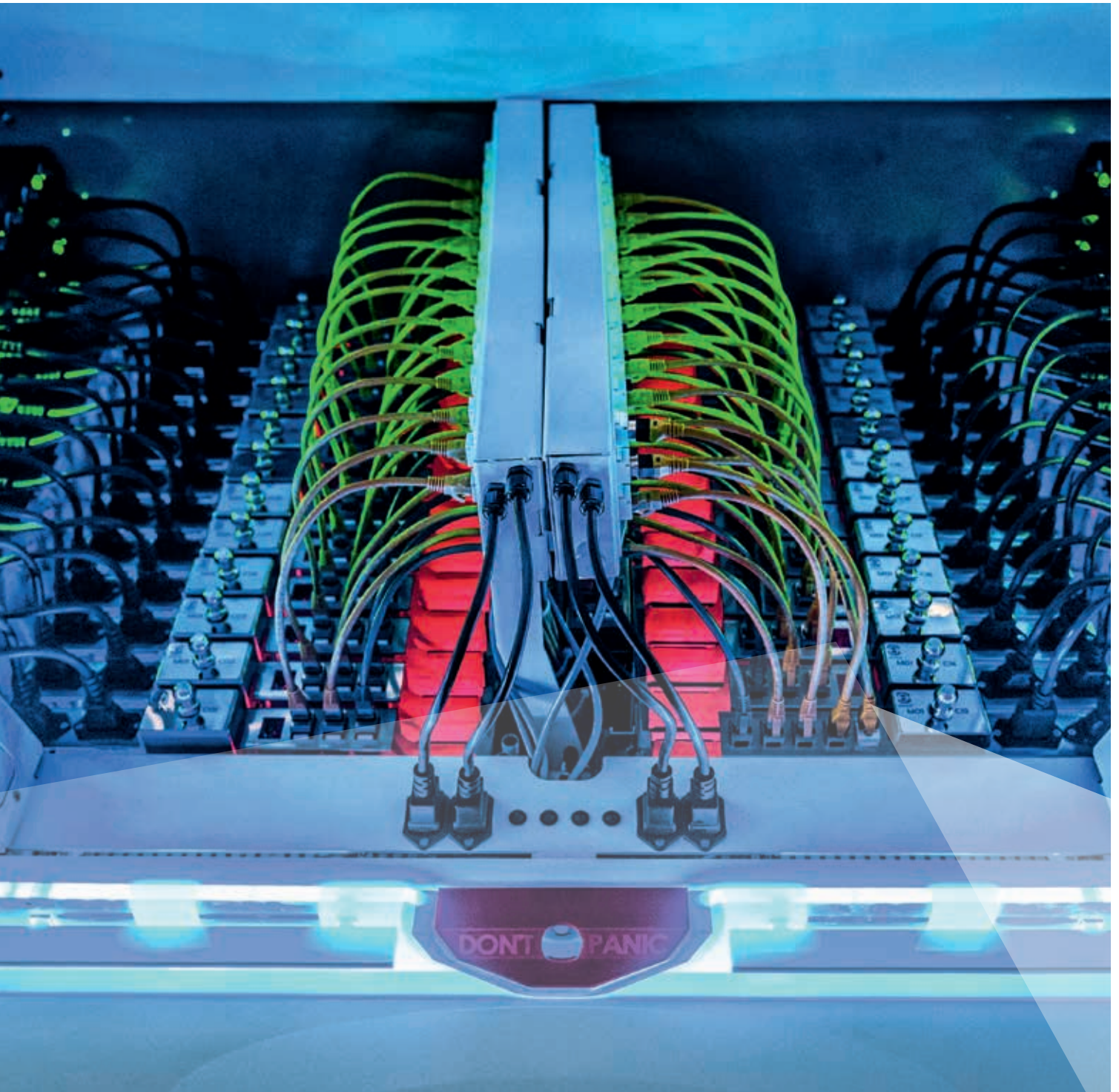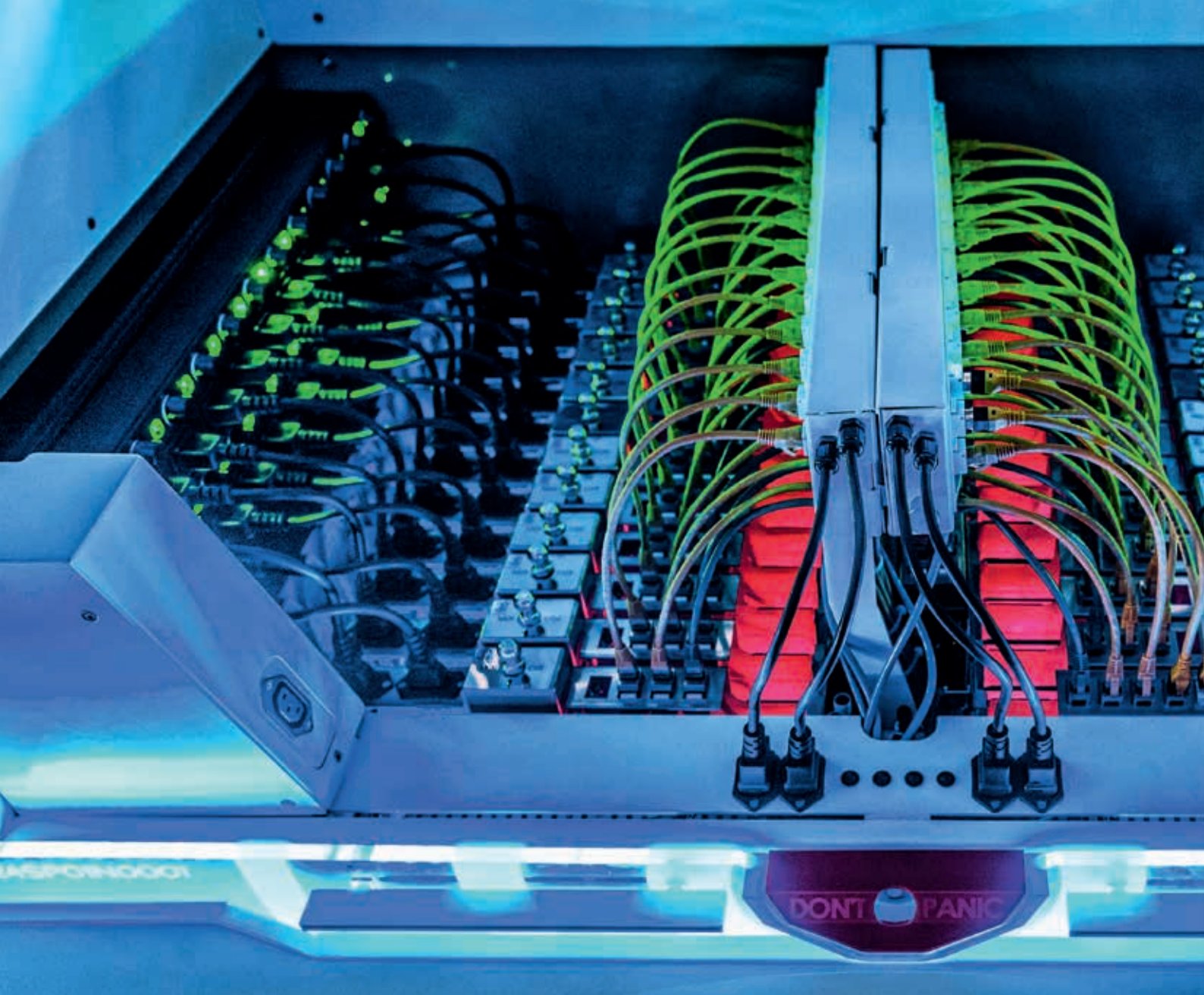
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Take a CPU, immerse it in a liquid, and turn it on. A recipe for disaster at first glance. However, the liquid not only cools the hardware extremely efficiently, the approach also drastically reduces space requirements and costs for data center operators, while also protecting the environment. Asperitas has developed Immersed Computing® and Bachmann has been involved from the very beginning.
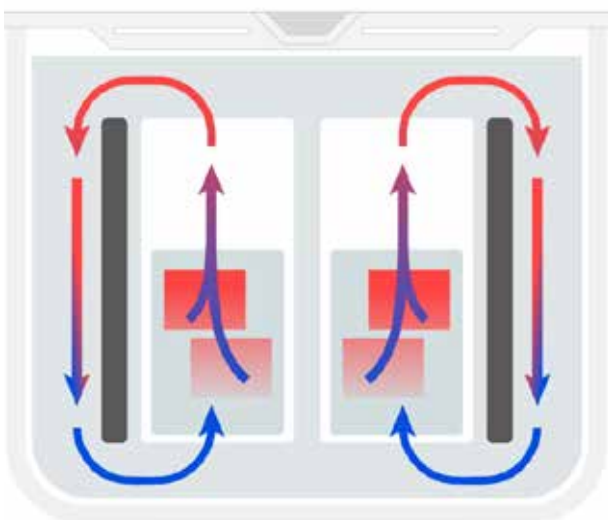
Worldwide demand for data processing and storage is increasing at record pace. And so, cloud service providers, emerging technology developers, telecom companies, and research institutions with high-performance computing systems increasingly require data centers to safely accommodate the necessary data infrastructure.

Developments such as artificial intelligence, in-depth data analysis, virtual reality, and the Internet of Things are massively increasing data center energy requirements. This not only drives up costs; the environmental impact is also growing. And in metropolitan areas in particular, the demand for data center space is huge.

From Air to Liquid

With its solutions, Asperitas wants to develop a global energy-neutral data center industry. To this end, the company offers plug-and-play systems that cool hardware using liquid. The specialists from the Netherlands make use of a physical phenomenon for efficient cooling: The systems use convection (heat transfer) to circulate the dielectric liquid and dissipate heat.
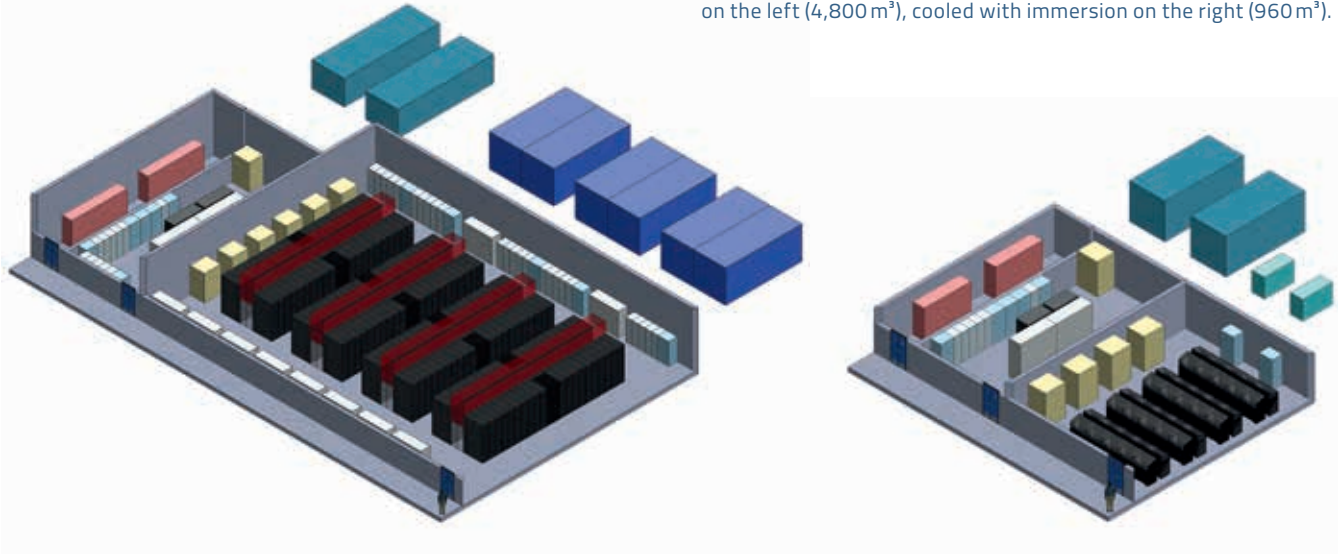
Minimal Maintenance

Thanks to the intelligent cooling concept, the company's systems operate without fans and pumps, significantly reducing maintenance costs. As components do not come into contact with oxygen, they are not at risk of oxidation. "The liquid absorbs and transfers over 1,000 times more energy than air," says Andy Young, CTO at Asperitas. The increased heat capacity enormously reduces thermal stress on hardware. The engineer is well aware that some customers might feel a certain skepticism about immersing hardware in liquid. "Immersion cooling ensures that far more energy is invested in processing data, rather than air chillers and fans, generating the most valuable assets for our customers. Our engineering processes and partnerships within the industry ensure maximum performance with minimum energy overheads; and our certification process ensures the highest reliability. This guarantees the reliable availability of data."

Intelligent cooling: The cooling liquid in Asperitas systems circulates solely through convection.

Utilized Energy

High performance hardware also leads to high cooling requirements, which in conventional cooling requires a significant number of cooling devices.

Asperitas has developed a system that ensures virtually zero heat loss: The immersion cooling liquid absorbs 97% of thermal energy from hardware and transfers it to water to be used for other purposes, such as facility heating systems. The effective cooling concept also facilitates higher ambient temperatures, removing the need for air-conditioning systems. Asperitas' solution reduces energy requirements for data center cooling by up to 95 percent.

Higher Performance in a Smaller Space

These savings also enable data center design to be simplified significantly – space requirements are reduced by up to 80 percent. The high-performance cooling capabilities of Immersed Computing® ensures processors can operate continuously at full capacity, increasing performance by up to 40 percent.

»With Bachmann's solutions, we are all set for future generations of our modules.«

Rolf Brink
CEO, Asperitas

Condensed hardware: Asperitas' Immersed Computing® solution houses up to 24 server cassettes: capacity for up to 3,072 processor cores, 96 TB RAM, and 768 TB storage with minimum space requirements.

ASPERITAS

– Specializes in developing outstanding solutions for energy-efficient and high-density data centers

– Since 2014, Asperitas has worked with cutting-edge partners to develop Immersed Computing® as a unique solution for the global data center industry

– The fully integrated, enclosed and liquid-cooled solutions include application-orientated and optimized server platforms

www.asperitas.com

Trust is Good, Control is Better

Systems are complex, and data is valuable. To ensure availability, Asperitas relies on comprehensive real-time monitoring. "This is where Bachmann comes in. Monitoring and control are fully integrated into our products. We use an M1 automation system with an MX207 CPU and GIO212 module as well as various sensors to monitor our hardware modules," says Andy Young. The M1 controls the cooling performance of heat exchangers using valves, ensuring heat dissipation remains constant. "IT equipment must be kept within a narrow temperature range to operate reliably at high performance levels over a long period of time. We're talking about years here," says the CTO. A constant temperature is also extremely important for modules connected in series: "The outflow of one system becomes the inflow of the other. You have to be able to rely on these temperatures at all times."

Making the Right Decisions

For Asperitas, the M1 controller represents a robust platform for stable operation. The monitoring system cannot be too complex, or take protective measures unnecessarily early. The M1 enables Asperitas to monitor a whole range of states within modules and associated IT components. "The flexible M1 system is at the heart of our products and allows us to implement sophisticated and robust decision-making processes based on a range of parameters," explains the experienced technician.

Close Collaboration for Flexible Systems

Asperitas modules have diverse requirements: For 'edge applications' in the telecommunications industry, customers require turnkey data center solutions. For large hyperscale data centers with thousands of computers, however, reducing complexity, providing only the most necessary features, is the key. "Bachmann gives us this flexibility. Their team accompanied us every step of the way. We developed the solution together from the very beginning," says CEO Rolf Brink.

Transparent Visualization

"It wasn't just the hardware that impressed us, the support from the team during software development was also outstanding," adds Andy Young. An atvise®-based portal visualizes all module data streams and states, and enables the configuration of control algorithms. Thanks to a simplified dashboard, Asperitas' customers always have an overview of overall status. "With the atvise® toolkit and support from Bachmann, we were able to develop the dashboard really quickly. Otherwise, we would have had to start from scratch," the CTO concludes.

Whatever demands are placed on Asperitas systems Bachmann helps keep requirements for surrounding infrastructure to a minimum. The CEO is sold: "With Bachmann's hardware and software solutions, we have found a great platform with which we are all set for future generations of our modules."

bachmann.