CUSTOMER STORY

NAUTILUS AND SESAME BY ITRENEW

Nautilus is making waves with a data center featuring sustainable closed-loop water cooling drawn directly from the source. The next-gen design leverages Sesame by ITRenew's equally sustainable, high-density hyperscale tech to reach new heights of efficiency and performance.

NAUTILUS® DATA TECHNOLOGIES + SESAME BY ITRENEW

JAMES L. CONNAUGHTON, CEO OF NAUTILUS DATA TECHNOLOGIES.

"Current air conditioning methods for cooling data centers are technically inadequate and environmentally unsustainable in being able to handle the next generation of high performance computing systems that will drive future economic, health, social, and environmental gains for society. Nautilus fundamentally rethought the best and most future-proof way to cool thousands of racks of servers by using naturally cold water, in a fully integrated system of pre-manufactured equipment and building infrastructure."

WAVE OF THE FUTURE

Maybe it was inevitable that Arnold Magcale would eventually develop a data center with a unique closed-loop water-cooled system.

During his decade of service with the United States Navy special operations, Magcale acquired a potent combination of both maritime and technical expertise. Some years later, after he had established himself as an IT innovator, entrepreneur and industry expert, he took those two distinct sets of knowledge and applied them jointly to his novel data center concept. It was an idea that would quickly make waves in the industry.

In 2013, Magcale founded Nautilus Data Technologies in Pleasanton, California to bring his vision of a truly sustainable waterborne data center to life. He was quickly joined by a group of engineers and IT leaders who viewed direct water cooling as the path forward not just for data centers but all the technologies and economic drivers that rely on them.

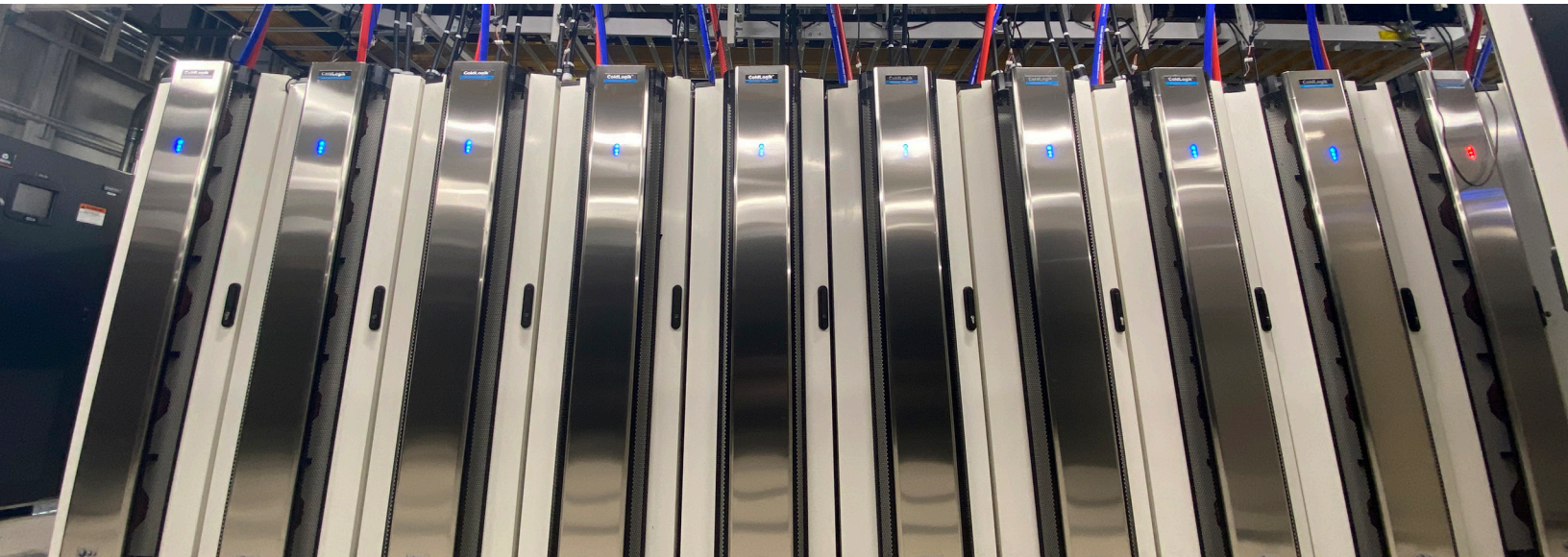
“Our proposition was that current methodology for air conditioning data centers is utterly unsustainable when it comes to the future computing that lies ahead. You have to rethink the right building envelope for the cooling of thousands of servers,” says James L. Connaughton, CEO of Nautilus Data Technologies.

Connaughton’s talk of sustainability isn’t mere lip service. He served as chairman of the White House Council on Environmental Quality and the Director of the White House Office of Environmental Policy from 2001 to 2009. For him, finding ways to maximize an organization’s economic impact while minimizing its environmental impact is a matter of course.

The design criteria for Nautilus’ pioneering data center facility were therefore straightforward if not exactly simple: How do you accomplish direct water cooling, anywhere in the world, at the lowest capital expenditure (CapEx), with the lowest operating expenditure (OpEx) and with the smallest environmental impact possible? And furthermore, how could be in done in a way that could help accelerate access to modern data services among people in emerging economies?

Arnold Magcale, Founder Nautilus Data Technologies, Chief Scientist.

James L. Connaughton, CEO of Nautilus Data Technologies.



A SEA CHANGE IN THE DATA CENTER INDUSTRY

An early prototype of the Nautilus data center was developed in partnership with the U.S. Navy, Applied Materials and Veolia. Results from real-world deployment not only proved the concept but delivered a glimpse into the kind of efficiency gains that could be realized at commercial scale. This initial success earned the company the 2016 Tech & Innovation Startup Award from the San Francisco Business Times.

Then work began in earnest to engineer, refine and validate a production-ready model of the Nautilus data center. Its advanced water-cooling system based on the company's patented TRUE™ (Total Resource Usage Effectiveness) technology would achieve a guaranteed industry-leading power usage effectiveness (PUE) of 1.15 around the clock. By comparison, the best-performing conventional data centers reach PUE values in the 1.4 range only under occasional peak conditions.

It's important to note that PUE is one of the few industry metrics that translates to hard costs. PUE is a calculation of the power and cooling costs a data center passes on to its customers. This "uplift," or energy markup, is calculated per 1kW of power that is delivered to a server rack. For example, the industry average PUE is 1.68, which means that for every $1 of power supplied to the rack, the customer pays $1.68. By lowering PUE 20–30% or more, the Nautilus data center delivers a significant operational cost advantage in both the near- and long-term.

And then there's the environmental component. Because the facility's intelligent water-cooling system uses naturally cooled water directly from the sea, lake or river on which it floats, there is no need for harmful greenhouse-gas refrigerants, intrusive cooling towers or computer room air handlers. That equates to a 30%—or greater—net reduction in energy-related CO2 and air pollution. What's more, Nautilus' closed-loop system produces no wastewater and therefore has no impact on water quality, fish or wildlife.

All told, the Nautilus design is around 70% more energy efficient than the industry average for large and medium-sized data centers.

LOWER PUE. LOWER COST. HIGHER EFFICIENCY

The significant operational advantages of water-cooled data centers

PUE, the per kW power and cooling markup a data center passes on to its customers, translates to hard costs. By lowering PUE 20–30% or more, the Nautilus data center delivers a significant operational cost advantage for every server, around the clock.

New data from Nautilus shows advanced water-cooling systems can reduce PUE & cooling costs by 20-30% for a significant operational cost advantage guaranteed industry-leading power usage effectiveness

The industry average energy markup per 1kW of power delivered to a server rack a data center passes on to its customers is 1.68, Which means for every $1 of power supplied to the rack, the customer pays $1.68. Nautilus' advanced water-cooling system lowers PUE to an industry-leading power 1.15 beating even the best-performing conventional data centers which reach PUE values in the1.4 range only under occasional peak conditions.

Industry average
PUE 1.68

Nautilus TRUE™
PUE 1.15

TAKING OPTIMIZATION EVEN FURTHER WITH ITRENEW

As innovative as their water cooled data center design is, Nautilus, was not satisfied to focus solely on the design of the facility itself. The company also prioritized the efficiency, performance and sustainability of the hardware required to fulfill their vision of reshaping compute, storage and networking for entire industries, economies and society at large.

To derive truly optimal performance from its next-generation data centers, Nautilus knew they needed technologically advanced server hardware capable of delivering on all fronts. It would have to be high-efficiency, high-performance equipment that maximized the efficacy of water cooling while also providing the flexibility and power to meet evolving workload demands. They also needed a strategic partner that, like them, was unencumbered by legacy data center models.

"NO OTHER JOINT OFFERING TO THE MARKET PROVIDES THE LOGISTICAL, OPERATIONAL, AND TECHNOLOGY ADVANTAGES THAT NAUTILUS AND ITRENEW CAN DELIVER."

"When we were working to identify the ideal strategic partner, we had three ultimate priorities for our customers: performance, efficiency, and sustainability," says Connaughton. "Any solution we chose would have to allow us to capitalize on those three key differentiators and take them to their highest potential. Sesame by ITRenew parallels our efforts in each of those fronts."

Much like Nautilus' pioneering approach to data centers, Sesame rack-scale compute and storage systems represent an inspired reimagining of what IT infrastructure is capable of and who can benefit from it. In a deliberate break from a status quo dominated by generic solutions and proprietary lock-in, the entire Sesame portfolio is purpose-built on a versatile open architecture that's fully optimized for even the most demanding workloads. Every solution arrives ready to deploy and brings with it significant economic advantages—to the tune of up to 50% lower TCO compared to what traditional OEMs can offer. Between their turnkey ease of deployment and lifetime cost savings, Sesame's fully integrated systems put hyperscale technology within everyone's reach.

In terms of control, Sesame systems are engineered to provide Nautilus with the ability to scale and adapt its infrastructure as its customers' needs change. Sesame solutions come in plug-and-play configurations that have been designed and optimized for Kubernetes orchestrations, AI/ML applications, hyper-converged infrastructure (HCI) and other cutting-edge, high-intensity use cases. Sesame's modular building-block design makes it easy to responsively scale all forms of capacity, complementing Nautilus' ability

to tailor its secure, private clouds on the fly to support enterprise environments that demand high kilowatt density, high performance and low latency.

Compute density is another Nautilus advantage that ITRenew strengthens through Sesame. Compared to off-the-shelf OEM equipment, Sesame's OCP-optimized form factor fits three nodes side by side instead of two. That results in a 50% increase in compute and storage power within a standard footprint. This ultra-compact design also centralizes rack-scale cooling and power, yielding more efficient energy consumption and stretching IT dollars even further. This makes Sesame the ideal hardware to integrate into Nautilus design, which accommodates high-density racks of up to 60kW per rack and ensures that heat transfer takes place at the rear of each rack. Cooling and airflow stay close to the heat source; no energy is wasted cooling unused space.

These massive increases in compute density naturally feed into Nautilus' third priority, sustainability. Studies have shown that data centers currently consume around 3% of the world's energy—a number that's only expected to grow to meet the insatiable demand for industrial and consumer technology. That has profound environmental knock-on effects. The dominant air-cooled data center model, for example, consumes up to 7 million gallons of public drinking water per megawatt.

Through its Sesame solutions, ITRenew enables Nautilus to minimize its environmental footprint in every conceivable way. There are the obvious direct benefits, such as the proven power and cooling efficiency of Sesame systems. But by forging close relationships with the world's leading hyperscalers and re-engineering their responsibly

Remarkable scalability and sustainability with a rapid time to value (TTV)

Shared vision of sustainability as an environmental and economic driver

A tightly integrated, mutually beneficial IT ecosystem

"SESAME BY ITRENEW ADVANCES THE THREE PRIORITIES THAT WE LOOK FOR IN DELIVERING VALUE TO OUR CUSTOMERS: HIGH-PERFORMANCE, ULTRA-EFFICIENCY, AND SUSTAINABILITY."

decommissioned hardware in line with the collective expertise of the Open Compute Project (OCP), Sesame drives down costs and carbon impact even as it drives up performance and scalability.

It's through these same circular economic models that Sesame circumvents the resource-intensive mining and manufacturing processes that account for as much as 75% of the carbon generation associated with the IT industry. That's because the creation of resilient, closed-loop supply chains goes far beyond the sustainable sourcing of materials. Sesame actually designs eWaste and CO2 emissions out of the process from the very start, thereby putting an end to the harmful byproducts that have been a part of the disposable hardware lifecycle for far too long.

Vastly reduced TCO through increased density and efficiency

The ability to solve real customer problems with joint go-to-market strategy

RESULTS

Buoyed by the power, flexibility and efficiency of Sesame solutions, the Nautilus data center is taking its industry on a new course through previously uncharted waters. The next-generation facility is testament not just to the possibility but the practicality of an entirely new data center model—one that harnesses renewable resources, both natural and manmade, to achieve economic and environmental targets that were once thought to be out of reach.

Sesame systems are fully integrated into the first commercial Nautilus data center, dubbed the Stockton 1 Data Center. Constructed at California's Mare Island Shipyard and commissioned in late 2020, it has realized all the promise of the original proof of concept, stripping away the complexity, points of failure and pollutants of the traditional data center design.

Along with those economic and environmental advantages comes increased accessibility. Around 80% of the world's population lives on or near water, and a resilient Nautilus water-cooled data center, powered by Sesame systems, can be constructed and deployed at virtually any port anywhere in the world in as little as nine months. That ubiquity, coupled with the symbiotic gains in performance and cost that Nautilus and ITRenew provide, makes it easy to put compute, storage and networking capacity right where it is needed most for both established enterprises and those in emerging markets.

"With Sesame rack-scale solutions integrated into our into our Stockton 1 data center design, our customers will experience the benefits of unprecedented control, scalability and sustainability. That means saving time and money, effortlessly meeting modern workload demands and aligning the environmental and economic imperatives that were previously thought to be irreconcilable."

About ITRenew

ITRenew, the Circular Cloud leader, refuses to settle for a world that pits economic success against social good. ITRenew creates second lives and reuse pathways for the most advanced technology on the planet, bringing circular economic benefits to the data center and IT hardware industry. This approach to unprecedented data, application workload and infrastructure demands opens up billions in new financial opportunity, slashes e-waste and CO2 impact, and makes hyperscale hardware accessible to and affordable for all. Our products and services power cloud and enterprise data centers, edge infrastructure, AI/ML, embedded and industrial systems, which is why the world's leading data center owners, service providers and enterprises choose ITRenew to revolutionize how their infrastructure is managed and deployed. ITRenew is headquartered in California with locations worldwide. To learn more, visit **itrenew.com** and follow ITRenew on LinkedIn and Twitter @ITRenewinc.

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