

THE UNIVERSITY OF CHICAGO VALIDATES WATERLESS, DIRECT-TO-CHIP LIQUID COOLING FROM ZUTACORE

HyperCool® Delivered Lower Energy Use and Consistent High-Performance Computing (HPC) for Scientific and Academic Research

Organization

University of Chicago

Industry

Higher Education & Research Computing

Challenge

Managing rising GPU-intensive HPC workloads while controlling heat and energy costs

Solution

ZutaCore® HyperCool® Direct-to-Chip Liquid Cooling

Results

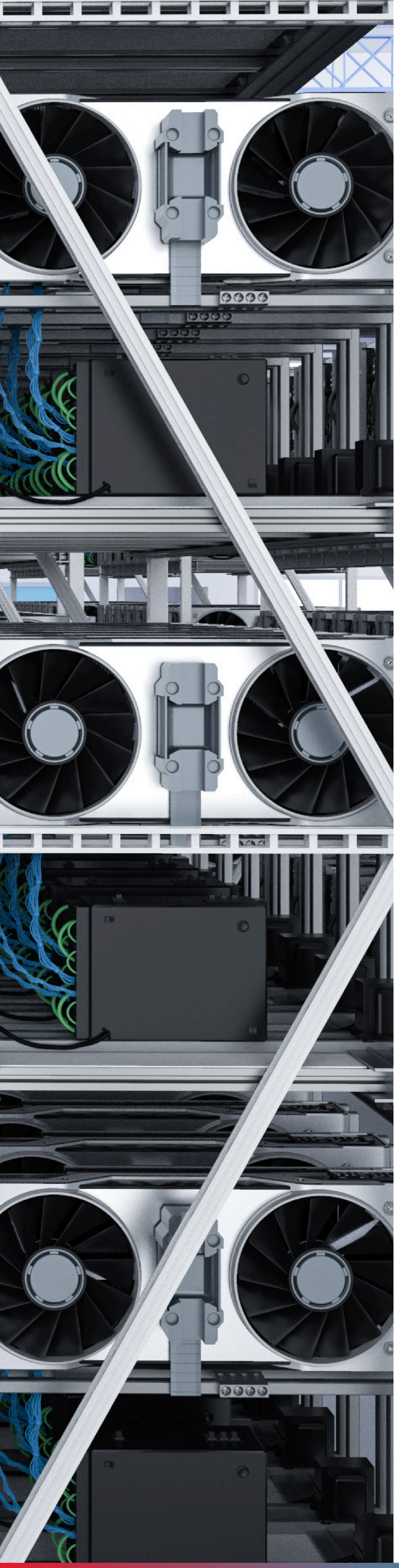
Lower internal cabinet temperatures, 37% power reduction, stable performance without throttling

Project Background:

Advancing Research With High-Density HPC

The University of Chicago enjoys a well-deserved reputation as one of the world's premier research universities. Campus facilities are constantly humming with a wide range of scientific and academic computing projects. Their on-site Research Computing Center (RCC) delivers high-performance computing (HPC) resources for departments and labs across campus, including groups like Maniac Lab and the Toyota Technological Institute at Chicago (TTIC).

Growing demands for AI, machine learning (ML), and complex simulations have driven power densities to increasingly towering highs. Traditional air-cooled approaches could no longer maintain the temperatures needed to prevent throttling or hardware stress in dense compute clusters.



The Challenge:

Cooling for Rapidly Evolving, GPU-intensive Workloads

The research computing teams at the University of Chicago have traditionally utilized rear-door heat exchangers (RDHx) to cool their systems. This legacy-style solution operates by routing hot exhaust air to a rear-mounted coil (generally filled with chilled water) for heat dissipation. Essentially, it's an air-to-liquid heat exchanger. While effective at lower densities, their RDHx systems were now struggling to maintain safe internal temperatures as server power demands increased. Excess heat stayed trapped inside cabinets, increasing fan speeds — and electricity bills — to keep systems online.

The University faced a clear mandate: support the GPU-heavy, data-intensive workloads of a modern high-density environment while controlling energy use, noise levels, and overall operational costs. To meet these challenges, the RCC needed a next-generation cooling solution capable of:

- Directly and efficiently removing heat from within the cabinet
- Reducing power consumption tied to cooling systems
- Future-proofing for rising thermal loads without redesigning the entire facility
- Delivering consistent, throttle-free performance for critical research workloads



The HyperCool Solution:

Benchmarking Waterless Liquid Cooling Against RDHx

It was time to identify an optimal cooling solution. The University opted for comprehensive side-by-side testing of its current system vs. a leading alternative technology from ZutaCore®. Their research teams set up an independent, side-by-side test to compare our HyperCool waterless liquid cooling technology with their traditional rear door heat exchanger (RDHx) solutions over the course of a week.

To be more specific, they would compare the following technologies in their proof-of-concept:

Baseline (Control Group):

Dell PowerEdge R6525 servers with AMD EPYC processors in RDHx-cooled cabinets.

HyperCool Test:

Identical servers, but in Chatsworth Products' (CPI) ZetaFrame® Cabinets integrated with the HyperCool waterless liquid cooling system.

Over seven days of rigorous testing, teams measured:

- CPU temperatures under load
- Noise levels
- Power consumption
- Overall compute performance

Ultimately, the results showed decisive benefits for HyperCool's waterless cold plates, even within the same physical footprint and with the same hardware specs

Why HyperCool?

The University selected the HyperCool waterless, direct-to-chip cooling system from ZutaCore for their test due to the unique benefits of this approach:

Waterless Operation:

HyperCool leverages the efficiency of liquid cooling while eliminating water usage entirely. This prevents leak risks and corrosion while supporting sustainability goals.

Lower Power Draw:

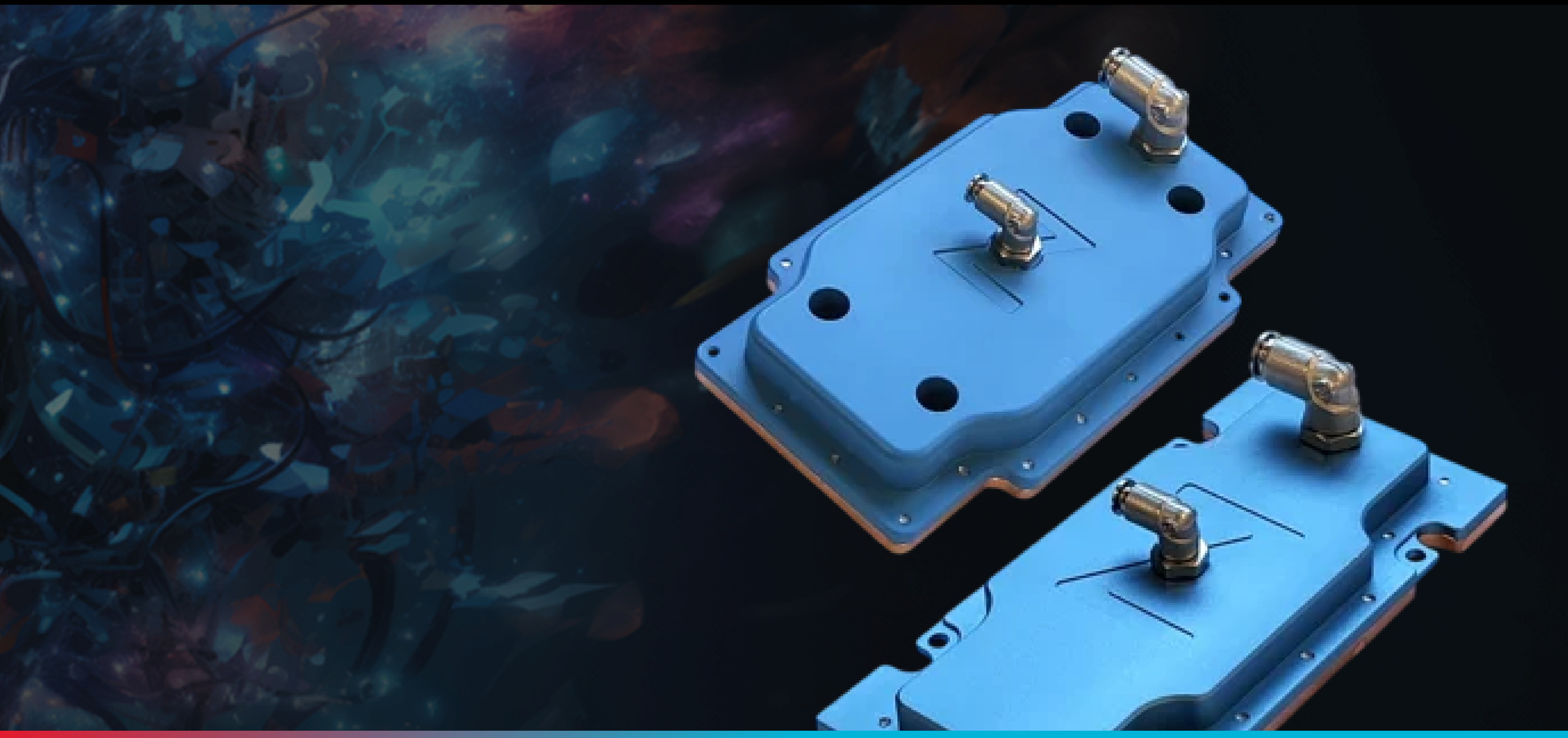
The system reduces or even eliminates reliance on high-speed server fans, and therefore, the high power draw that comes with them.

Superior Thermal Control:

Even in dense computing environments, liquid cold plates dramatically reduce cabinet temperatures, ensuring stable and safe CPU operating conditions.

Ease of Integration:

HyperCool fits directly into Chatsworth Products' ZetaFrame Cabinet System. Retrofits are also easy; the University could maintain the same footprint and update cabinets one at a time, causing minimal disruption.



Results and Future Plans:

Cooler, Quieter, More Sustainable HPC at Scale

The final outcomes of the test validated HyperCool as a reliable and efficient alternative to traditional RDHx designs, ready to support cutting-edge research with a reduced environmental impact. The University recorded:

Substantially Lower Cabinet Temperatures:

Average internal temperatures dropped from ~130°F with RDHx to ~80°F with HyperCool — a 50°F reduction compared to RDHx!

37% Energy Reduction:

The ZetaFrame cabinets demonstrated significantly lower power consumption, primarily due to the reduction or elimination of high-speed fan usage.

Sustained Performance:

Stable CPU temperatures, even under heavy computational loads, prevented throttling and maximized output for demanding HPC and AI tasks.

Improved Operational Environment:

Lower fan speeds reduced noise and exhaust heat. Server rooms simultaneously became more efficient and more comfortable.

Encouraged by their testing success, the University of Chicago now intends to expand its use of ZutaCore for waterless liquid cooling. The research teams have already begun planning for broader deployment of HyperCool across additional HPC clusters.

Early lessons also highlighted:

- The benefit of managing temporary maintenance or service interruptions with robust, user-friendly connection hardware
- Opportunities to further fine-tune and optimize system configurations for job mix
- Interest in exploring further energy efficiency advancements

The success of the proof-of-concept generated excitement across the University of Chicago's research teams. Their broader research community recognizes the operational benefits and ability of HyperCool to support energy efficiency goals while meeting escalating computational demands.

Looking Forward:

Paving the Way For Sustainable HPC and AI

Today’s most advanced computing clusters don’t enjoy a reputation for energy efficiency. However, contrary to public opinion, the jump to sustainability is already within reach.

The rigorous evaluation of the HyperCool technology at the University of Chicago demonstrates that energy-efficient, high-density HPC is achievable today. HyperCool cuts power usage, reduces noise, and maintains stable, high-performance operations even under demanding AI workloads. ZutaCore has set out to create a new standard for sustainable, research-ready cooling, and this proof-of-concept shows that the technology is ready to meet the moment.

We’re proud to support leading academic institutions as they innovate, expand, and build the next generation of high-performance, environmentally conscious compute infrastructure. To learn more about how HyperCool can transform your data center

GET IN TOUCH WITH ZUTACORE TODAY!

