Direct Contact Liquid Cooling Doubles Compute Capacity in Existing Racks at Cascade Technologies

The Customer

Cascade Technologies develops, markets and supports high fidelity Large Eddy Simulation (LES) and Computational Fluid Dynamics (CFD) engineering analysis tools across many industries. Based in Palo Alto, CA, the company bridges the gap between fundamental research in LES and its application. The team consists of PhDs with deep experience in fluid and thermal sciences, physical modeling, numerical analysis and High Performance Computing. Many researchers are alumni of Stanford University's Center for Turbulence Research and of the Department of Energy's Advanced Simulation and Computing programs, also located at Stanford.

Customer Challenges

Cascade Technologies approached CoolIT Systems with a data center density problem. The team required a significant increase in onsite computing power to handle the setup and testing of its complex simulations. However, this computing upgrade project had to be accomplished within the existing IT floor space and the current air conditioning system that had already reached maximum capacity. Further necessities included both a reduction in noise levels and overall operating costs. After reviewing multiple technologies and vendors, Cascade Technologies chose CoolIT Systems to provide and install liquid cooling technology to meet all of these challenging requirements.

CoolIT Systems Solution

CoolIT Systems is addressing Cascade Technologies' needs to increase computational power within its existing racks and infrastructure using highly efficient Direct Contact Liquid Cooling (DCLC). The upgraded cluster now contains 100 liquid cooled Dell C6100 dual processor servers across two racks. The liquid is managed with CoolIT Systems Rack DCLC™ CHx40 heat exchange module which feature centralized pumping to provide liquid to the dual processor servers. The CHx40's are rack-mount, liquid-to-liquid heat exchangers that can manage 40kW+ of cooling capacity per rack using warm water to cool the servers. The need for additional chillers or other expensive cooling was eliminated by the integration of a simple dry cooler, which was installed on the roof to very efficiently lower the temperature of the specialized coolant.

The installation was completed in October 2015.

"Partnering with CoolIT Systems solved our key requirements of more compute density without having to expand our floor space or AC capacity. The liquid cooled solution surpasses our efficiency goals, allows us to pack a lot of compute into a small environment, and is impressively quiet."

Frank Ham, CEO
Cascade Technologies

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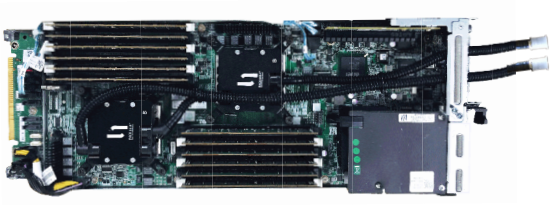
Our Modular Approach

CoolIT Systems Rack DCLC™ solution for Cascade Technologies is a flexible, three module installation that includes:

- **Server Module:** The in-server components manage heat loads from the processors with dedicated coldplate assemblies for each part. Each Server Module terminates in a Stäubli dry-break quick disconnect, allowing for safe and simple removal of servers from the cabinet.



- **Manifold Module:** A pair of vertical manifolds are installed at the back of each rack, one on the right side and one on the left side of the cabinet. This allows simple decoupling of a single server without the need to remove a neighboring system by way of the quick disconnects.

- **Heat Exchange Module:** Each rack is outfitted with a 2U, liquid-to-liquid CHx40 heat exchange module which circulates coolant through the racks and servers and rejects this energy to a facility water feed connected to the rooftop heat rejection system.

Customer Benefits

As a result of the upgrade, Cascade Technologies is successfully running an in-house, high-density HPC cluster that handles the setup and testing of its LES and CFD analysis tools for engineering applications. CoolIT Systems' custom Rack DCLC™ solution was simple to install, is easy to service and has increased density by 2.5 times when compared to the client's previous air-cooled system. The enhanced performance capabilities, enabled by liquid cooling, provide the Cascade Technologies research team with enough capacity for their present and future compute needs.

The custom-built system uses 45°C or higher temperature inlet water to keep the uptime of the servers maintained 100% of the year without the need for chillers. An additional advantage is a reduction in overall data center OPEX. A bonus improvement is that Cascade Technologies employees now enjoy a significant reduction in noise levels emanating from their data center room.

HPC Setup

- 2 CoolIT Systems Rack DCLC™ CHx40's
- Dual CPU liquid cooled Server Modules
- 2 racks / 100+ Dell C6100 dual processor servers
- 45°C primary fluid supply temperature

Results

- 50% of total IT load managed by liquid cooling
- 80kW total heat load managed
- 2.5 times more compute capacity
- Zero additional air cooling systems
- Significantly lowered data center OPEX
- Reduced noise pollution

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