Two-Phase Direct Contact

Liquid Cooling Ecosystem

Configurable to Your Data Center Density Needs

ZUTACORE™

UNLOCKING THE POWER OF COOLING

Parker

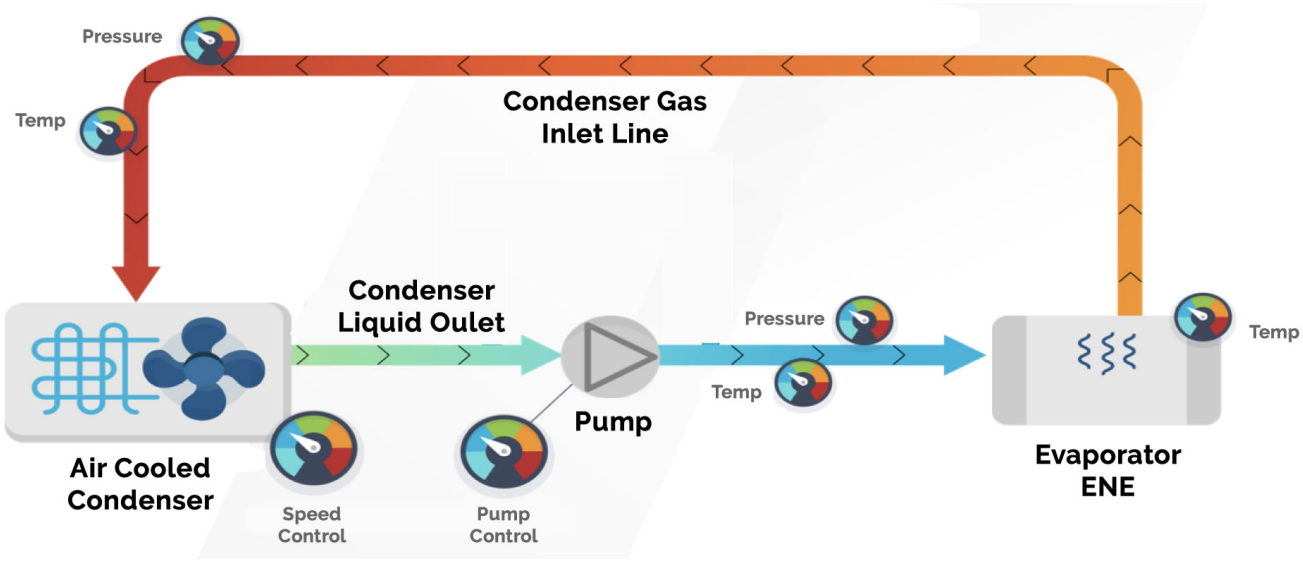
Turning CPU Heat Waste into Data Center Efficiency

A key solution to provide more performances, economy and sustainability for data centers, regardless of size.

Using a non-electrically conductive fluid from 3M, the dual-phase direct cooling system from ZutaCore will never damage your IT components, even in the improbable case of a leakage.
Its refrigerant nature allows lower flow rate than water cooling, small and robust Parker pipe cross-sections, and tinier pumps. This reduces data center complexity, streamlining cooling installations for a sustainable system well suited for Edge computing environments as well as larger data centers.
High densify server farms can drain heat without sacrificing their small and modular server units. Help maximize your real estate assets and plan longer term evolution in the same buildings. The dual phase cooling from ZutaCore solves chip and server-level hot spots.
No need to upgrade the data center rooms to provide more space for cold corridors and large ventilation units. Lower your cost and accelerates the RoI (Return on Investment) for cooling systems thanks to the HyperCool™ technology platform from ZutaCore along with Parker connectors and 3M fluid.
Last but not least, it alleviates cooling boundaries for current and upcoming processor generations, including GPUs and AI processors.

A Competitive Advantage

Effectively managing the growing issue of heat dissipation is critical to maintaining a competitive advantage. HyperCool™ addresses this by delivering optimal IT performance in the data center in a cost effective way. Furthermore, it adheres to increasingly stringent environmental requirements thanks to the ZutaCore and Parker ecosystem, using 3M engineered fluids.



The two-phase, direct contact, liquid cooling architecture design

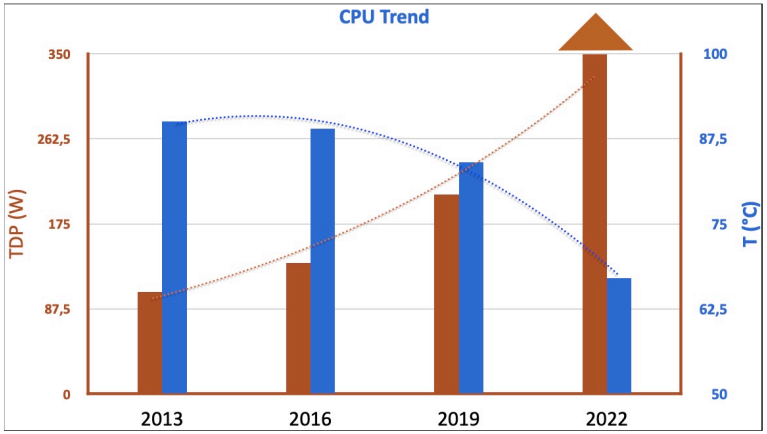
A Co-Innovation With Concrete Results

Direct-on-chip CPU cooling is an effective way to reduce your total cost of ownership, ensure efficient cooling, control energy consumption and increase server density.

How do you simultaneously reduce the temperature of your servers while containing the cooling system costs?
With business users' dependency on digital services, the IT operations must no longer suffer but rather anticipate the risks induced by the increasing thermal dissipation of servers.
IT servers are retaining ever more powerful redundant power supplies to contain the risk of failure of highly available clusters or server farms. At the same time, multi-core processors are handling more and more data-intensive workloads, resulting in increased heat dissipation.
In case of overheating, modern processors slow down their clock cycle, to a halt if necessary.

Two phase, direct contact, waterless liquid cooling reduces risk of IT meltdown

Compared to water single phase cooling systems, it uses less space, allowing implementations in server small units (1U). Moreover, to cool several 200 Watt CPUs in rack servers, the dual phase cooling system from ZutaCore in collaboration with Parker and 3M requires only 3.6 liters of dielectric fluid in a cycling flow, ten times less than water systems.
And the energy required to operate it is 50% less.
As server power supplies are delivering more electric power, the water cooling system will soon reach their limitation, in terms of diameter of water inlet/outlet pipes.
This will limit their possible use to larger rack server units only.
The two-phase direct-on-chip cooling system is able to refresh more than 100 kW systems in a rack, without requiring a large radiator that would be incompatible with small factor rack servers.
As a result, more servers can be stacked in a single high-density rack, which can triple the number of workloads being handled in the same form factor.



Source : Intel

Heat Dissipation at the heart of Digital Factory

Data centers are global digital platforms in need of a new standard and effective cooling system. HyperCool is an easy-to-install, easy-to-use system that ensures servers do not overheat.

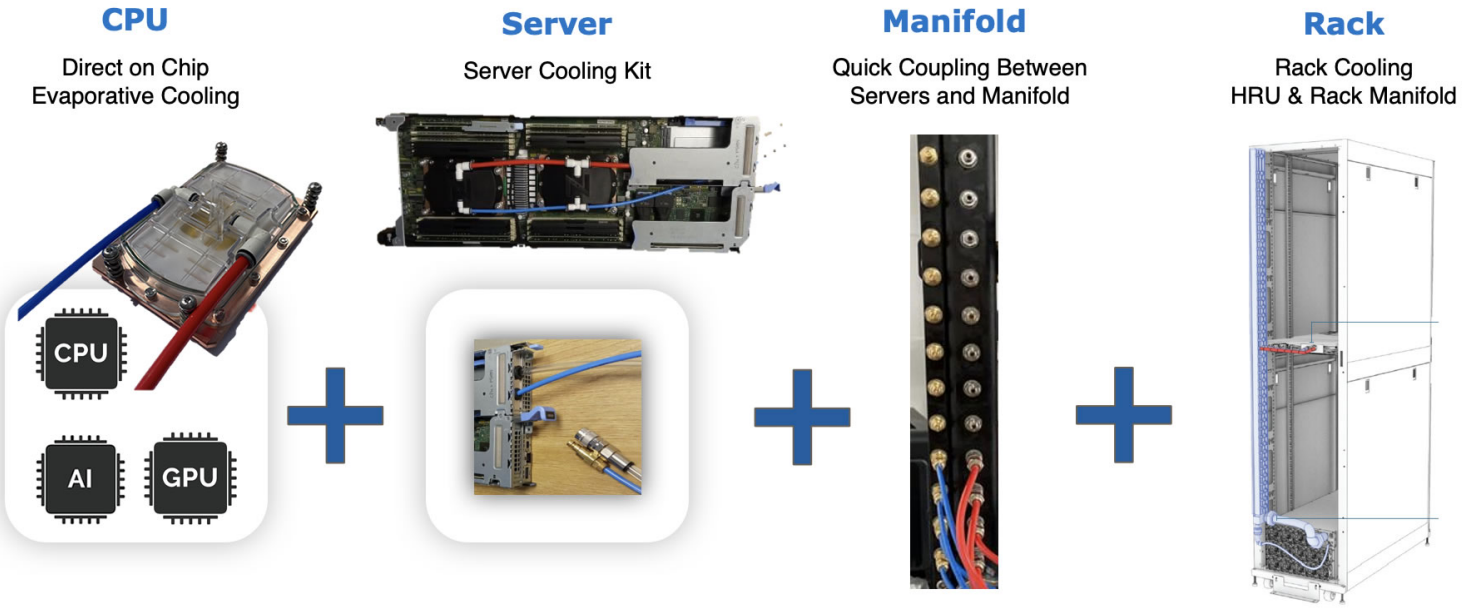
Advanced cooling solutions have emerged recently to improve the cooling ability of high density servers. How can they increase heat transfer efficiency? By placing cooling equipment just above the heat generator processors including CPUs, GPUs and AI chips.

To optimize the CPU cooling while reducing fire hazard and energy consumption in the data centers, ZutaCore and Parker recommend a co-innovation using 3M fluids able to:

- Reduce operating temperature elevation and server fire starts
- Provide savings through OPEX
- Scale with your server farms
- Stay environment-friendly

No need to design your buildings with additional and expensive structures to facilitate the air flows.

The ZutaCore HyperCool™ two-phase cooling system uses Parker's connectors and fittings, carefully tested together with 3M™ Novec™ 7000 Engineered Fluid.
On the server side, the micro-processor frequency is auto-matically adjusted "on the fly" depending on the actual computing needs, to conserve power and to reduce the amount of heat generated by the CPU.
Two small units should be installed in the server rack: the Heat Rejection Unit (HRU), and the Refrigerant Distribution Unit (RDU), with connections between them, and between the servers and the RDU.
Present and next generation servers will need direct-on-chip cooling, with no impact on their form factor. An attribute ZutaCore HyperCool can bring as of now.

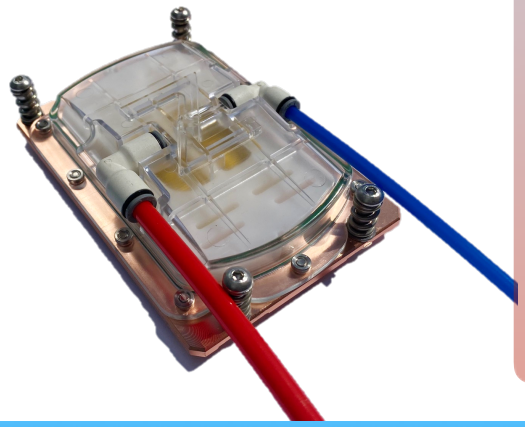


On Demand Cooling Tuned to IT Workloads

ZutaCore brings an on-demand and autonomous cooling system with CPU dynamic frequency scaling to preserve power and reduce heat.

Datacenters are the cornerstones of the Internet and key enablers of enterprise digital transformations.
Traditional data centers use 40% of their energy consumption to cool the processors. Today however, they can be optimized to dedicate significantly less electricity to cooling by leveraging two-phase, direct contact liquid cooling.

« *Through the phenomenon of latent heat, the heat from the CPU causes the refrigerant to change its state from liquid to heat-removing vapour* » explains **Shahar Belkin, ZutaCore Vice-President R&D**.
With such a simple system, the engineering innovation is all about giving the physics all it needs to do the cooling process at the right place and time. In today's data centers, the number of CPU cores per square meter is economically promoted, to deliver more and more services.
The new challenge is to find compact solutions that can cool the ever increasing number of high power processors while preserving the footprint of the rack / server.
Oil and water single phase cooling systems are short term solutions as they provide lower energy efficiency. The dual-phase direct cooling system from ZutaCore combines the law of gravity with vapor pressure generated by the non - conductive fluid from 3M. Continuously monitored, the server temperature stays optimal for the data center.
To enhance system performance, ZutaCore's software-defined cooling (SDC) platform can identify opportunities to optimize processing and cooling parameters. With the SDC, data center operators can customize temperature, utilization and power consumption, for the exact server requirements, to surpass typical efficiencies.



About ZutaCore

ZutaCore is a direct-on-chip, waterless, two-phase, liquid cooling technology company, that unlocks the power of cooling. By dissipating heat at the source, ZutaCore's HyperCool™ cuts the amount of cooling power infrastructure needed from the server to the data center. Eliminating the risk of IT meltdown and engineered for low-flow and low-pressure, allows for light compact design and high densities. Coupled with on-demand and closed-loop features, HyperCool™ maximizes cooling efficiencies, guaranteeing consistent performance in any climate and, at any location. The ZutaCore solution is a complete hardware system, enhanced by an optional software-defined-cooling (SDC) platform. The result – the data center shrinks, scarce energy, water, land and construction resources are saved, CAPEX and OPEX are slashed, return on investments (ROI's) are accelerated and the value of real estate assets are maximized.

Immediately Functional in Both Phases

Parker has conducted extensive chemical compatibility testing with the dielectric fluid from 3M in order to validate the ZutaCore standard solution.

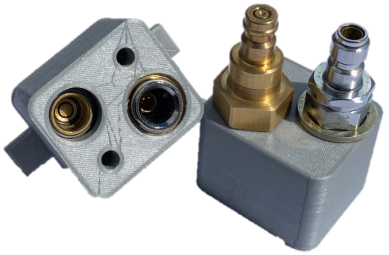
The LIQUfit™ push-in fitting from Parker was proposed to ZutaCore to convey the dielectric fluid from 3M. Until then, it was mainly used with water cooling and medical flows. Thus, connectors and joints had to be tested with the 3M fluid, carefully checking the impact of its two phases (gas and liquid) on the materials properties:

« *Parker's approach is to offer peace-of-mind leak-free connection solutions. That's what we did with ZutaCore. Chemical compatibility tests confirmed the absence of both refrigerant contamination and premature polymer aging* », said **Laurent Pouchard**, **Business Unit Manager (Direct OEM) at Parker Hannifin**. « *Leakage and mechanical properties were checked over time, in the presence of 3M™ Novec™ 7000 Engineered Fluid* », he added.

Moreover, Parker and ZutaCore developed specific connectors such as the Blind Mate coupler. This partnership simplifies the connections between the RDU and the servers, without having to turn the rack. The solution is immediately functional. The disconnection of a rack unit causes no dripping or leakage, allowing safer maintenance operations.

In 2020, such partnerships and testing activities have helped to validate the solution and to create a virtuous ecosystem.

LIQUfit™ push-in fittings



ZutaCore & Parker
Blind-Mate-08KLPR04MENS

Parker Hannifin is a Fortune 250 global leader in motion and control technologies. For more than a century the company has been enabling engineering breakthroughs that lead to a better tomorrow.
Learn more at www.parker.com or @parkerhannifin.

Two-Phase Direct Contact Cooling

How to improve server efficiency with low cost operations? Follow the six steps below to implement your two-phase direct contact cooling strategy.

1

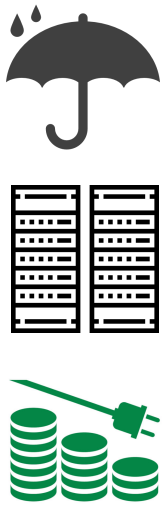
Taking inventory of your existing servers
Server density is growing fast, calling traditional cooling into question. Direct-on-chip heat dissipation meets multicore CPUs current expectations. And tomorrow's processors will also need direct contact cooling because of fast memories and GPUs embedded.

2

Avoiding potential sealing problems
Thanks to robust and standard connectors, the ZutaCore & Parker Blind-Mate-08KLPR04MENS can be connected and disconnected at will. Try it with a Proof of Concept, then equip your site, room after room.

3

Selecting an open standard solution
Open 19 compliant solutions fits in all your standard 19" racks, while OCP (Open Compute Project) is focusing on efficient, flexible, and scalable solutions.



4

Controlling your costs while scaling
The proliferation of physical and virtual machines causes a diversity of environments beyond the control of operators with cascading energy costs as a consequence. A direct contact cooling system helps to control your energy costs.

5

Planning once, deploying everywhere
Compatibility and impermeability tests are carried out by Parker and ZutaCore to offer a compact solution matching today's server requirements. This co-design, along with the ecosystem global distribution, guarantee long-term efficiency and unified deployment of a solution that is easy to install, to use and to maintain.

6

Delivering the best quality of service
More processing capabilities, and more insights will be required by an increasing number of end-users, everywhere. This requires IT distributed systems to be cooled and monitored in 24/7, breakdown risks being continuously anticipated and mitigated.

GLOSSARY

Cluster: A server farm with nodes working together, controlled by a unified software.

COP: Coefficient of Performance of heat pumps defines how much heat (or cold) can be generated with every watt of energy.

CPU: Central processing unit, the processor that performs basic arithmetic, logic, controlling, and input/output operations specified by the software instructions.

ENE: Enhanced Nucleation Evaporators, two-phase cold plate.

GPU: Graphics processing units, a specialized electronic circuit designed to accelerate the creation of images and to process large blocks of data in parallel, making them suitable for AI and cryptographic applications.

HRU: Heat Rejection Unit is a self-contained liquid cooling system that is designed to support harsh environments.

PUE: Power Usage Effectiveness, a ratio (Total Facility Power divided by IT Equipment Power) describing how much extra energy a data center requires to maintain IT equipment for every watt delivered to the equipment.

RDU: Refrigerant Distribution Unit responsible for cooling system and processor heat.

SDC: Software-Defined Cooling helps data center operators with opportunities to leverage software for resource optimization, cooling assets virtualization and predictive operations.

For more information:

ZUTACORE™
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