

## Next Generation of Data Center Infrastructure based on Direct-to-Chip Liquid Cooling

The growth of generative Artificial Intelligence, Machine Learning and High Performance Computing is driving a new standard for data centers. The increase in high compute CPUs and GPUs inside data center racks is challenging the conventional cooling strategy. This needed shift in technology is driving commercialization urgency for Liquid Cooling.

Direct-to-chip liquid cooling is becoming a requirement to cool high performance compute servers. Liquid cooling is much more effective than air cooling - it keeps critical equipment from overheating and enables AI and high-compute applications' optimum performance.

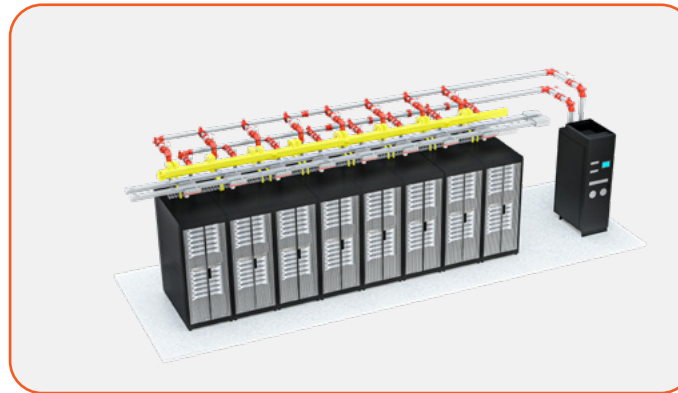
However, traditional air-cooling has not left the datacenter. Liquid cooling works in addition with air-cooled technology, splitting the load to reject all the heat from the rack. This new cooling strategy marks a revolutionary change in the approach to cooling data centers.

Vertiv is introducing full data center infrastructure solutions using its Vertiv™ CoolChip technology to serve the newly emerging high-density market.

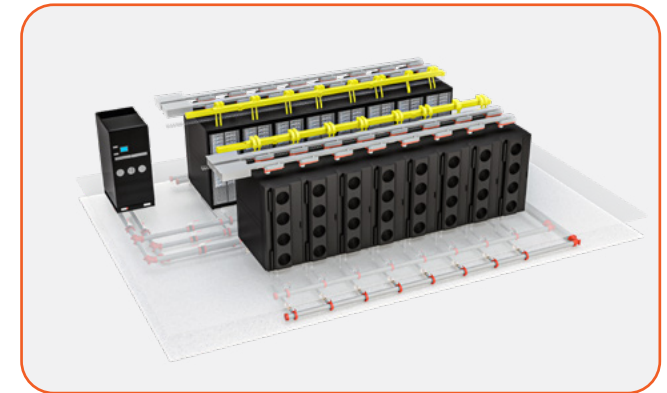
These solutions can be stand-alone, installed within an existing data center building, or as fully equipped, prefabricated, scalable, modular solutions, ready to be deployed to site location.

With integrated, pre-engineered, and prefabricated infrastructure, you can rapidly achieve your objectives, simplifying and drastically shortening on site time required to install and startup, and reducing the potential for risk, quality, or schedule delays.

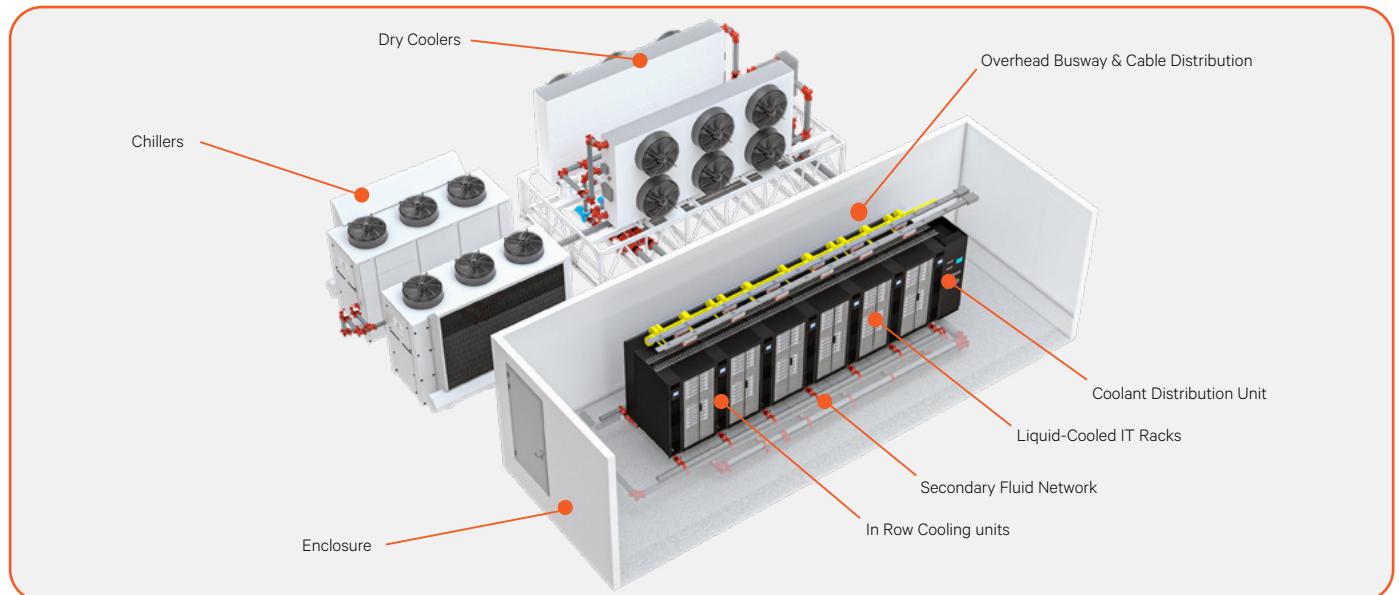
Vertiv has developed three **Vertiv™ MegaMod™ CoolChip** concept designs to support direct-to-chip liquid cooling solutions, differentiated in the way that they address the air-cooled architecture portion. Each air-cooled architecture has its own benefits - from flexible perimeter cooling, to room neutral in-row cooling and finally the space-saving rear-door heat exchangers - find which design is the right fit for your data center.



Vertiv™ MegaMod™ CoolChip with Vertiv™ Perimeter Cooling



Vertiv™ MegaMod™ CoolChip with Vertiv™ Liebert® DCD rack-mounted rear door heat exchanger



Vertiv™ MegaMod™ CoolChip with Vertiv™ In-row Cooling

**Vertiv™ MegaMod™ CoolChip base design includes:**

- Vertiv™ Cooling infrastructure:
  - Vertiv™ XDU – Cooling Distribution Unit to manage the entire secondary fluid network and supports an innovative contaminant-free design that ensures the highest water quality while providing essential separation of the primary facility water from the ITE heat load power dense spots
  - Vertiv™ XDM - Split indoor chiller with integrated pumped refrigerant economization
  - Vertiv™ Air Cooling units – High-performance thermal management solutions featuring variety of perimeter cooling units, in-row cooling units or rear-door heat exchangers
- Vertiv™ Liquid-cooled Racks - Vertiv racks to secure critical devices and enable high density applications
- Vertiv™ rPDUs – to ensure reliable power distribution, with basic, monitored or switched rPDUs
- Vertiv™ Row & Rack Manifolds - to provide common connection points between Cold Plates within servers and the Vertiv XDU
- Integrated Secondary Fluid Network
- Overhead Busway & Cable Distribution
- Auxiliary systems, as option
- Vertiv™ Environet™ Alert real-time monitoring and visualization for critical infrastructure, as option

	Reference Topology with Vertiv™ CoolChip and Vertiv™ Perimeter Cooling	Reference Topology with Vertiv™ CoolChip and Vertiv™ In-row Cooling	Reference Topology with Vertiv™ CoolChip and Vertiv™ DCD
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<b>General</b>			
Region	EMEA / NAM / LATAM		
<b>IT Hall Direct-to-Chip Cooling Solution</b>			
Air-to-Liquid Cooling Ratio	5%-30% Air vs 70-95% Liquid		
Type of Liquid Cooling	Single-phase direct-to-chip		
<b>IT Racks</b>			
No. Of Racks per Row	up to 12		
<b>Electrical</b>			
Power per Rack	100+ kW		
Busbar System	Single or Dual Supply		
rPDU No.	Single or Dual Supply (1, 2 or 4 pcs)		
rPDU Type	Basic, Monitored (unit level) or Switched (unit level)		
<b>Mechanical</b>			
Cooling Technology	Perimeter standalone cooling unit (DX, CW, FC, EFC)	Air-water cooling unit for lateral attachment to server cabinets	Air-water heat exchanger mounted on rack cabinets rear-door
Cooling Redundancy	N or N+1		
Cooling Units	Various Vertiv Perimeter Cooling Units	Liebert® DCL or Liebert® CRV (EMEA) / Liebert® CRV (NAM)	Liebert® DCD
Coolant Distribution Unit	Liebert® XDU or Liebert® XDM (NAM only)		
<b>Secondary Fluid Network (SFN)</b>			
Rack Manifold Material	Stainless Steel or Plastic		
Row Manifold Material	Stainless Steel, Copper or Plastic		
SFN Location	Floor or Overhead		