Air Cooling Liquid Cooling Immersion Cooling Power Manager / Sustainability

Smart Cooling for PowerEdge

Sustain server performance while minimizing carbon footprint

Meeting the need for cooling datacenters head-on, Smart Cooling technology offered in PowerEdge Servers combines energy management with intelligent cooling solutions.

Air Cooling (Multi-Vector Cooling) learn more

High performance air cooling is a combination of superior design and intelligent controls. Dell delivers both in the latest PowerEdge systems. Advanced system design processes, leveraging extensive airflow simulation, create system layouts that maximize cooling effectiveness. Closed-loop software controls adapt to the environment to provide just the right amount of air flow to cool the system.

- **Optimized System Designs** – with a symmetric system motherboard layout and corner-mounted PSUs, airflow is balanced, and cooling is efficient. Streamlined airflow reduces pre-heat for card slots as well. Lastly, separating the PSUs enables better cable routing to PDUs, reducing long cords that impede air flow.

- **Latest Fans & Heatsinks** - cost-effective standard fans or high performing Dell-designed fans are leveraged to provide the perfect amount of air to optimize system cooling. New heatsink designs improve CPU cooling capability while streamlining air distribution through the chassis. Compared to less sophisticated designs, Dell platforms support higher component power and density than ever before.

- **Multi Vector Cooling (MVC)** - provides the intelligent closed loop control system that adapts to environmental changes and configuration updates to dynamically adapt air flow through the chassis. The result is the right amount of air flowing to the right locations inside the system, leading to maximum efficiency.

Direct Liquid Cooling (DLC) learn more

Dell's Direct Liquid Cooling solution is an effective way to cool dense, high-performance server solutions. Factory installed cold-plate loops in each server connect to a rack and data center coolant network, managing component heat more efficiently than air cooling alone.

- Broad platform enablement means DLC is available on mainstream 1U and 2U platforms in addition to dense compute systems.

- Leak Sense technology – standard on all Dell DLC solutions, any fluid leak at the cold-plate will be detected and reported immediately via iDRAC, alerting customers of potential issues before they escalate. If a coolant leak occurs, iDRAC can even automatically power down the server.

- Available in capacities ranging from a single rack solutions up to a multi-row large scale solutions.

Keeping servers cool

Smart Cooling technology is intrinsic to the design of every PowerEdge Server, from the uniquely engineered chassis to the integrated software management system.

- Intelligent airflow

- High performance cooling with Direct Liquid Cooling (DLC)

- 100% heat capture and high efficiency with Immersion

- Automated cooling through adaptive control algorithms
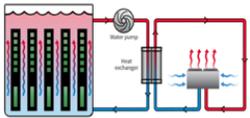
Immersion Cooling

Innovative liquid solutions which use fluid-filled enclosures to hold racks of IT, ideal for facilities lacking traditional raised floors and conditioned air. Immersion project are supported through Dell's OEM custom project team.

- **Single-phase Immersion –** oil-based fluid, pumped slowly through IT racks, with heat exchanged to facility water. Proven, mature technology available globally.
- **Two-phase Immersion –** higher performance and higher complexity solution based on engineered fluids designed to boil at low temperatures. Supports higher density for extreme performance.

Power Manager

With introduction of iDRAC Datacenter license and OME's power manager one-to-many capabilities you can monitor and manage power and cooling at the system, rack and datacenter levels.

- **System Airflow Consumption** - allowing airflow balancing at the rack and datacenter level
- **Delta-T & Exhaust Temperature Control** - Users can specify the temperature limit of the air exiting the server to match their datacenter hot aisle limitations
- **PCIe airflow settings** - Users are provided a comprehensive PCIe device cooling view of the server that informs and allows cooling customization of 3rd party cards.

Smart Cooling comparisons			
	Air cooling	Direct Liquid Cooling (DLC)	Immersion
Cooling Solution Options			
Products	Traditional air-cooling and air-handling equipment	• CPU/GPU Cold-plate loops • Rack/facility level DLC products required	Single-phase (1P) and Two-phase (2P) Immersion tank solutions
Environments	Traditional data centers	Traditional data centers, with facility water	• Non-traditional spaces, no conditioned air required (ex. - warehouse) • Note: facility water required
Main use	• Low to Mid-density deployments • Up to ~ 15kW/rack	• High-density racks • Systems with high TDP parts • Up to ~80kW/rack	• Mid to High-density racks, or high TDP parts • Limited/no air cooling available
Typical Cost Adder	None	**+**	1P: **+** 2P: **++**
Vendors	Dell Technologies	CoolIT	1P: GRC, Asperitas, Submer, etc. 2P: TMGcore, LiquidStack
How to sell	Position Multi-Vector cooling	PowerEdge direct (Servers); Extended Tech (rack and facility level)	Dell OEM program

Recommend services and support

Dell Technologies Services global scale and unmatched expertise provide you with the assurance that your PowerEdge servers will run securely and optimally throughout your entire PowerEdge journey. Accelerate deployment with the **ProDeploy Enterprise Suite** and receive the expertise you need from planning through implementation and beyond for even the most complex environments. You're depending on your PowerEdge servers, so get proactive and predictive support with the **ProSupport Enterprise Suite,** to maximize workload availability and minimize disruptions. If you need help with on-going operations, choose from a variety of **Consulting, Residency, Education** and **Optional Support Services** to address your specific needs. Availability and terms of services vary by region. For more information, please contact your Dell Technologies representative or visit us online at Dell.com/services

Dell Smart Cooling

We help customers deal with their thermal challenges of today and tomorrow with a multi-faceted solution that is intelligent and sustainable. We can:

- Help customers gain the flexibility of choosing the right cooling technology (air, liquid, immersion or a combination) for their specific use cases

- Ensure servers sustain higher performance with self-aware systems that are interconnected and can respond automatically to changing variables

- Reduce IT expense, environmental waste and the carbon footprint of your data center

For more information, visit: www.delltechnologies.com/ondemand.

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