Lenovo Neptune® Liquid Cooling battlecard

High-performance computing and AI workloads demand advanced cooling solutions to maximize efficiency and sustainability. This battlecard explores the benefits, challenges, and competitive advantages of Lenovo Neptune® Liquid Cooling in enabling smarter, more energy-efficient data centers.

Audience

Target persona	What they care about
CIOs and CTOs	• Balancing AI performance with energy efficiency and sustainability goals • Future-proofing infrastructure for evolving HPC and AI demands • Reducing operational risks with proven, enterprise-grade cooling solutions
AI/ML engineers	• Maximizing model training speed and AI workload performance • Ensuring system stability for uninterrupted high-compute processes • Accessing cutting-edge hardware optimized for AI acceleration
IT decision-makers	• Improving data center efficiency with high-density cooling solutions • Reducing cooling-related downtime and maintenance costs • Simplifying deployment and integration with existing infrastructure
Business decision-makers (BDMs) and CFOs	• Gaining a competitive edge with faster time-to-insight for AI initiatives • Lowering cost through energy savings • Meeting corporate sustainability and ESG commitments

Market drivers and IT challenges

AI and HPC growth

The rapid expansion of AI, machine learning, and high-performance computing requires more powerful systems, generating higher heat loads that traditional air-cooling struggles to manage efficiently.

Sustainability and energy efficiency mandates

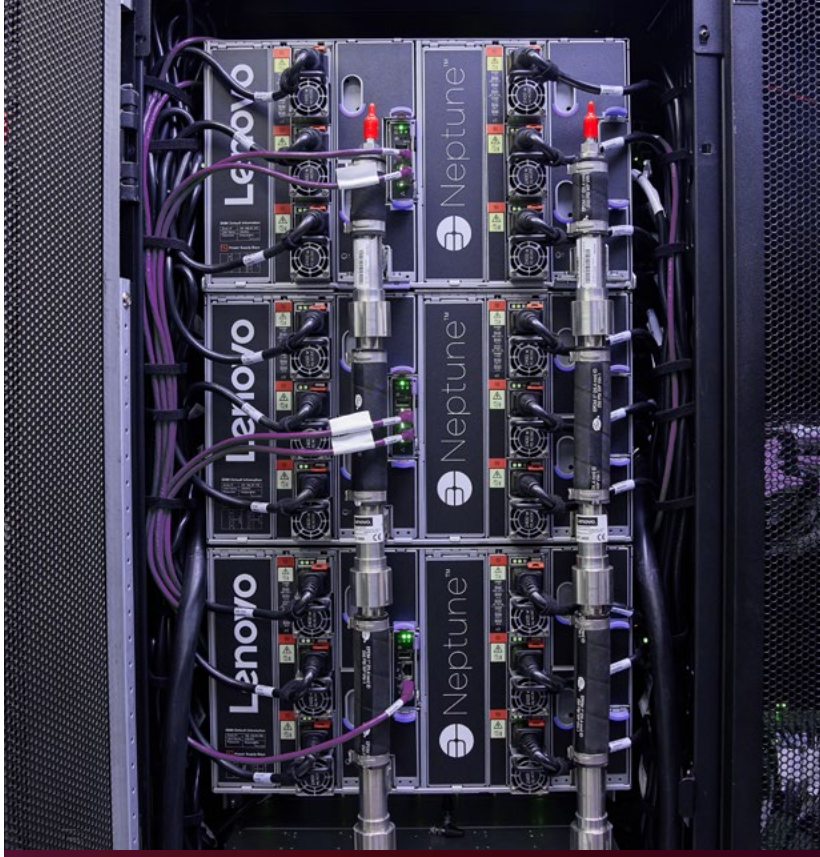
Organizations face increasing pressure to reduce energy consumption and carbon emissions, making liquid cooling an essential solution for meeting sustainability and ESG goals.

Data center density and space constraints

As workloads grow, organizations need to maximize computing power within limited physical space, driving demand for high-density, liquid-cooled solutions that optimize performance without expanding footprints.

Rising energy costs and cooling limitations

With global energy costs increasing, traditional cooling methods become less viable, making liquid cooling a cost-effective alternative that improves energy management and drives power efficiencies.



Overview

Lenovo Neptune® Liquid Cooling maximizes performance, efficiency, and sustainability for AI and HPC workloads. Liquid cooling technology removes heat more effectively than air cooling, enabling faster processing, and reducing power consumption compared to traditional air cooling.

Elevator pitch

Lenovo Neptune® Liquid Cooling delivers cutting-edge efficiency and performance, powering some of the world's fastest supercomputers[1]. Its direct liquid cooling removes heat more effectively than air, allowing CPUs and GPUs, including NVIDIA accelerated GPUs, to run at peak speed while cutting energy costs.

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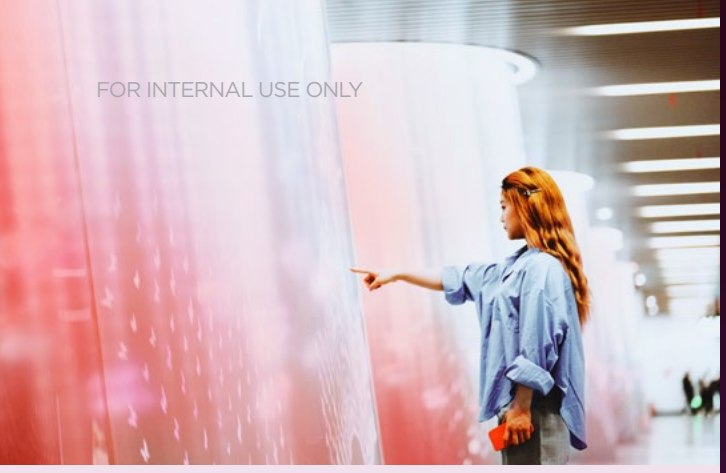

Value proposition

Lenovo's innovative Neptune® Liquid Cooling technology offers:

Balanced innovation

Get the performance you need for AI workloads — without sacrificing sustainability efforts.

Performance

Neptune® accelerates AI, HPC, and data-intensive workloads by enabling CPUs and GPUs to run at peak efficiency.

Sustainability

Advanced liquid cooling reduces energy consumption compared to traditional air cooling, supporting your environmental goals. 6th Gen Lenovo Neptune® systems deliver up to 100% heat removal, and reduce power consumption by up to 40%[2].

Density

Compact design maximizes compute power within a smaller footprint for greater efficiency, optimizing your use of space.

Competitive advantage

Faster processing speeds drive innovation, from AI breakthroughs to scientific discoveries.

Lenovo Neptune® Liquid Cooling advantages

Time-tested innovation

With over a decade of experience and hundreds of patents in liquid cooling technology, Lenovo Neptune® has been instrumental in powering some of the world's fastest supercomputers[1]. This extensive expertise ensures that organizations can deploy high-performance AI and HPC solutions at any scale, benefiting from cutting-edge cooling innovations.

Industry recognition

Lenovo Neptune® liquid cooling won the 2024 Business Intelligence Group Sustainability Product of the Year award and is CRN's 2024 Best Green Energy Product of the Year and winner of the 2024 SEAL Sustainable Product Award.

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Lenovo Neptune® helps NVIDIA GPUs run more efficiently. For maximum energy savings, NVIDIA Blackwell-based systems, including the NVIDIA HGX™ B200, are 12x more energy efficient than previous generations.

Comprehensive power and cooling services

Lenovo offers TCO assessments, power and cooling best practices engagements, or full design and implementation, helping you optimize performance and sustainability for new AI and compute-intensive workloads.

The right solution for every organization

Lenovo offers a comprehensive suite of solutions tailored to different data center requirements, including:

Rack water cooling
Uses rear-door heat exchangers or in-rack cooling distribution units to efficiently remove heat at the rack level, reducing reliance on traditional air-conditioning.

Direct water cooling
Delivers warm water directly to CPUs, GPUs, and other critical components, eliminating the need for internal fans and enabling higher processing performance with lower power consumption.

Liquid-assisted cooling
Enhances traditional air-cooled systems with thermal transfer modules or liquid-to-air heat exchangers, supporting high-wattage processors without additional plumbing.

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Not all liquid cooling approaches are the same.

Here's what makes Lenovo Neptune® stand out:

- Neptune® can use PG25 or deionized water for open loop cooling, allowing for higher energy efficiency, lower pressure drop, and higher thermal capacity.
- Neptune® uses high quality copper loops, and brazed joints rather than O-ring fittings since they are known for their leak-free performance, support and stability.
- Copper tubing (versus competitors' FEP tubing) maximizes heat capture and eliminates leaks.
- Specially treated EPDM hoses maintain water chemistry to prevent corrosion and provide greater flexibility than the plastic tubing used by some others in the market.
- Patented cold plate designs maximize heat extraction to cool accelerators consuming ~700W today and 1000+W in future.
- Neptune® servers are pre-tested as a solution (not as individual systems), shipped air-pressurized and leak-checked onsite, reducing the chance of leaks during shipping.
- Lenovo provides first-line support for all Neptune® solution equipment and components, from servers to CDUs, unlike competitors that require each vendor to support its own components.
- Unlike most of the industry, Neptune® full-system direct water cooling uses unchilled (warm) water (up to 40-45°C) rather than requiring chillers, dramatically reducing power requirements. Hot exhaust water can be reused/recycled in the facility, turning waste heat into value.

Conversation starters

What sustainability goals or energy efficiency initiatives are in place for your data center operations?	Lenovo Neptune® Liquid Cooling can help you achieve up to a 40% reduction in power consumption, aligning with your sustainability objectives.
How is your organization scaling AI workloads, and what challenges are you facing with compute performance and cooling?	With over a decade of liquid cooling innovation and hundreds of patents, Neptune® enables AI workloads to run at higher speeds for longer, maximizing performance without overheating.
Are cooling limitations impacting your ability to fully utilize high-performance CPUs and GPUs for AI and HPC workloads?	Neptune® direct water cooling allows processors and accelerators to operate at peak efficiency, preventing throttling and supporting the highest performance AI and HPC workloads, including NVIDIA Blackwell-based systems.
How are rising energy costs affecting your IT infrastructure decisions, and are you exploring solutions to reduce power consumption?	By using warm water cooling (up to 45°C) and eliminating the need for chillers, Neptune® dramatically reduces cooling-related energy costs and even enables waste heat reuse for greater efficiency. The thermal energy in the heated exhaust water can be reused for other purposes, such as building heating.
What strategies are you considering to maximize compute density without expanding your data center footprint?	Neptune® supports 100kW+ per rack without requiring specialized air-conditioning, enabling higher-density computing while reducing infrastructure constraints.
Are you looking for ways to future-proof your AI infrastructure while balancing performance and sustainability?	Neptune® is designed for next-gen AI and HPC, cooling accelerators consuming ~700W today and 1000+W in the future, ensuring your infrastructure is ready for evolving workloads.

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Competitive analysis

	Lenovo	Dell Technologies	HPE
Offering name	**Lenovo Neptune® Liquid Cooling**	**Dell Smart Power & Cooling**	**HPE Liquid Cooling**
Scope	Open and closed loop liquid	Hybrid Direct Liquid Cooling and Enclosure Cooling	Fanless Direct Liquid Cooling
Focus areas	• AI, HPC, high-density computing, sustainability	• General power and cooling efficiency, server- and enclosure-level heat management	• General power and cooling efficiency, server-level heat management
Strengths	• Directly cools where heat is generated at the motherboard for higher efficiency and better thermal performance • Proven expertise with over a decade of liquid cooling innovation and AI-driven optimization	• Server- and enclosure-level liquid cooling helps manage large-scale data center heat loads • Integration with Dell's broader Smart Power solutions	• Direct liquid cooling at the server level with focus on data center energy efficiency • Emphasis on modular cooling for scalable deployments
Weaknesses	• May have higher upfront costs compared to traditional air-cooling solutions	• Does not address heat at the component level, leading to potential inefficiencies	• Requires significant infrastructure adjustments for full implementation
Differentiators	• Lenovo XClarity provides centralized management and monitoring for Neptune® cooling • Specifically designed to support AI workloads with enhanced cooling for high-performance GPUs and CPUs	• Dell OpenManage integrates cooling insights with power management • Primarily positioned as a hybrid power and cooling solution with AI considerations	• Integrates with HPE iLO Advanced with cooling analytics for system monitoring • Focused on power efficiency for a range of workloads, including AI but not exclusively

Resources

For additional information and resources, visit the Lenovo Hybrid AI landing page.

Visit the Neptune page.

Read the Neptune whitepaper.

Watch the Neptune video.

Sources

1 TOP 500, "Green 500 List," November 2024. Lenovo is the #1 Supercomputer vendor per the TOP 500. 9 out of 10 of Lenovo's fastest supercomputers use Neptune.
2 Per Lenovo internal testing

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