

Smarter technology for all

S T A C [®]	<i>Where strategy meets technology™</i>
SUMMIT	<i>London / May 4, 2023</i>

Lenovo Innovation and Sustainability

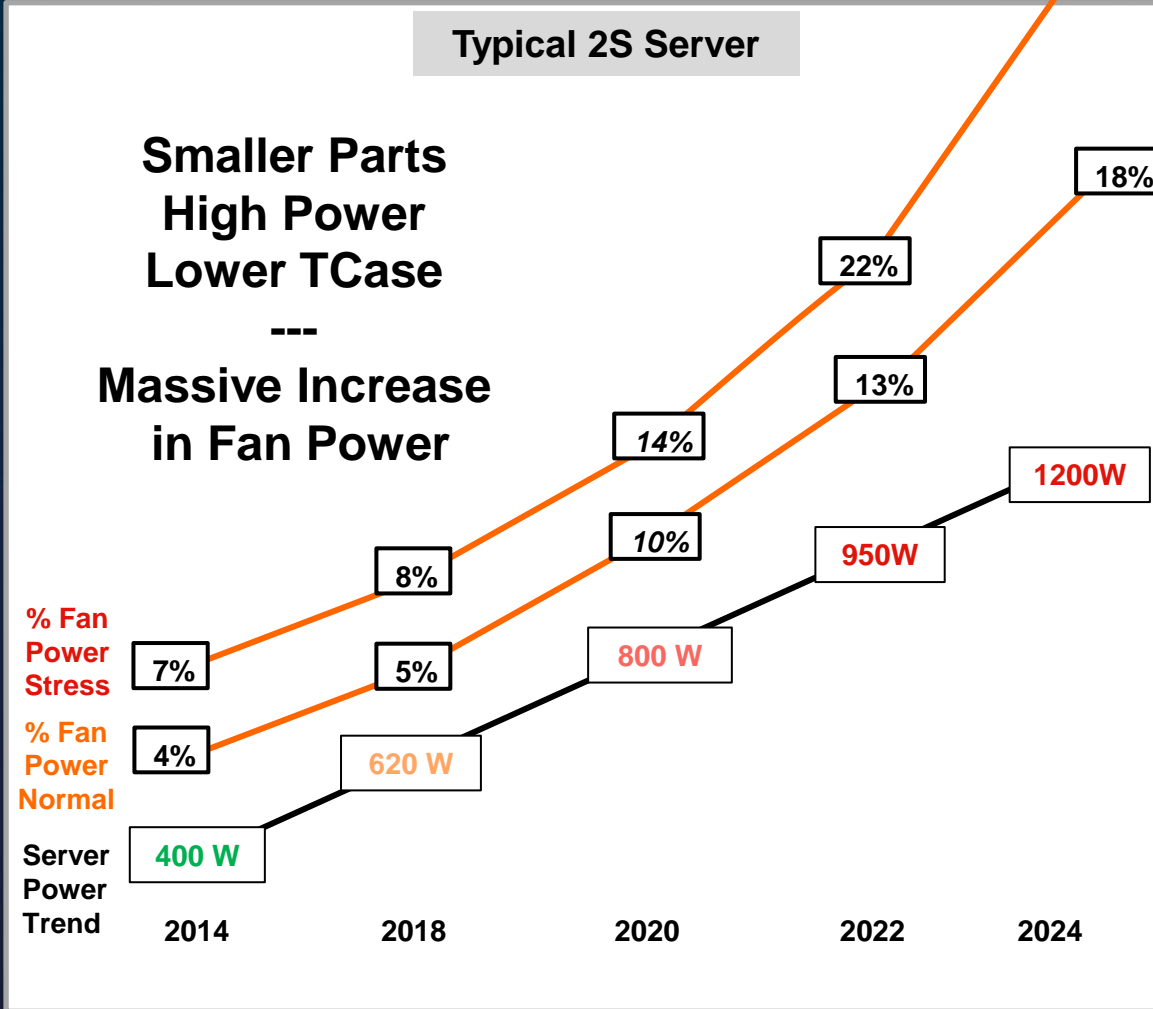
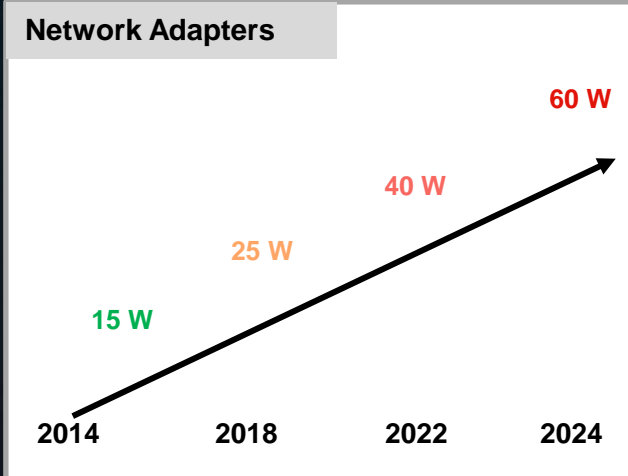
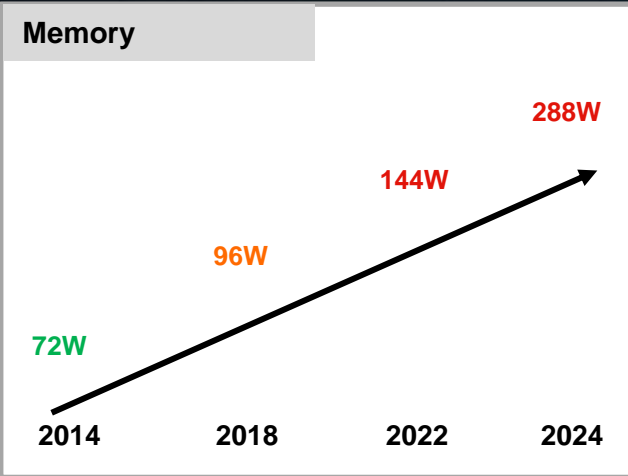
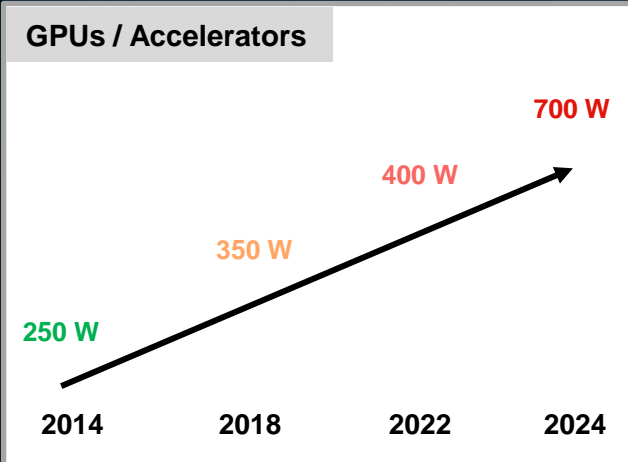
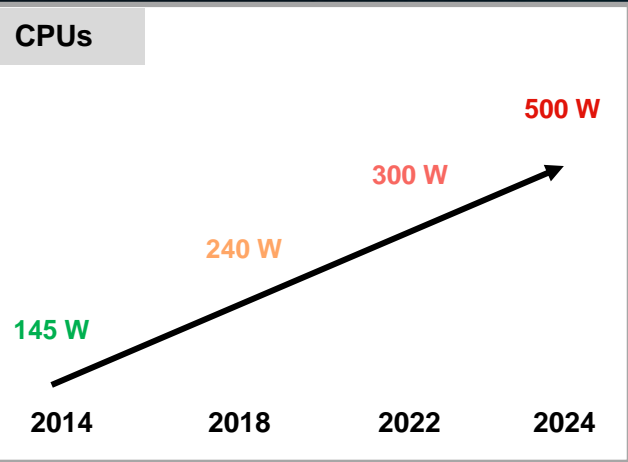
Lenovo

Dave Weber, Global FSI CTO
4 May 2023



Traditional Cooling Approaches are Reaching Critical Limits

It's Hot!



Smarter Engineering = Energy Efficiency

Energy Management Tooling *Measure, manage, optimize power*

xClarity Energy Manager (LXEM)



Energy Aware Runtime (EAR)



Heat Mitigation Innovation *Lower fan speed, less power*

Liquid to Air Exchanger (L2A)



Thermal Transfer Module (TTM)



Efficient Component Selection *Same work, less power*

Titanium Power Supplies



Idle Power State Controls

Dynamically optimize the frequency and power control

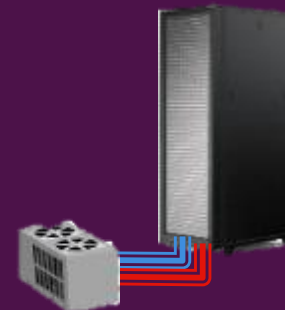
Low Loss Materials



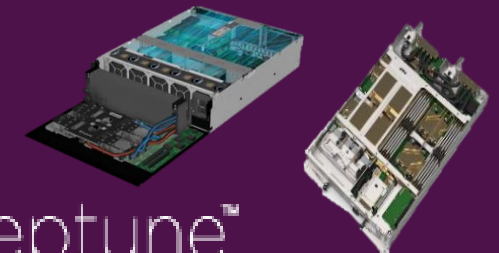
Liquid Cooling

Rethink how cooling gets done

Rear Door Heat Exchanger



Liquid Cooled Systems



Barcelona Supercomputing Center accelerates groundbreaking research



BSC challenge

- Optimize processing its dataset-intensive multi-omics workloads to advance precision medicine treatments against diseases

Definition: Multi-omics is a new research approach where the data sets of different omic groups are combined during analysis

BSC outcomes

- 80x times faster processing of whole exomes
- 40x times faster processing of whole genome
- Lenovo partners with BSC, making a \$7M investment in R&D for sustainable supercomputing to advance precision medicine
- Jointly developed new system software (EAR, Energy Aware Runtime) for the optimization and energy efficiency of HPC tools



"Lenovo is a long-term partner of BSC. We've helped many scientists who come to the MareNostrum from institutions all over the country make impressive discoveries utilizing Lenovo HPC technology, and we look forward to continuing this work in the years ahead."

Miguel Vazquez, Ph.D. Head of the Genome Informatics Unit, Barcelona Supercomputing Center

Lenovo Neptune™ expands to new ThinkSystem V3 servers

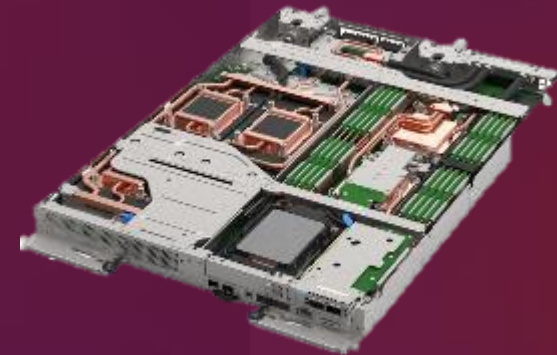
Helping customers reduce their environmental footprint by providing sustainable solutions

Liquid-to-Air Cooling



- Currently available on ThinkSystem SR670 V2 GPU-rich system, and the **new SR675 V3 GPU-rich system**
- **Expands to 1U ThinkSystem V3 Servers - SR630 V3 & SR645 V3**
- Provides added thermal margin to cool 350W CPUs in a storage-rich configuration
- Delivers the benefits of liquid cooling in an air-cooled system
- Ideal for CAE or EDA and software-defined storage applications in legacy air-cooled data centers

Direct Water Cooling (5th Gen)



- ThinkSystem SD650 V3 & SD650-I V3 servers with 4th Gen Intel® Xeon® Scalable processors and CPU Max series with High Bandwidth Memory (HBM)
- ThinkSystem SD665 V3 & SD665-N V3
- A warm water temperature solution
 - Supports highest bin CPUs at peak performance
 - **Captures up to 100% of the system heat using up to 50°C input water temperature***
 - **Up to 40% energy savings¹ by eliminating system fans**
 - **Maintain 1/2U density without compromising performance while saving energy**

Lenovo Neptune[®] Technologies – Save Power

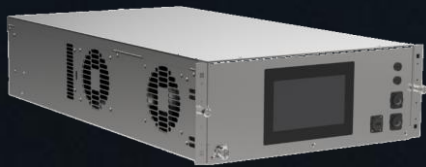


RACK WATER COOLING

Rear Door Heat Exchanger (RDHX)

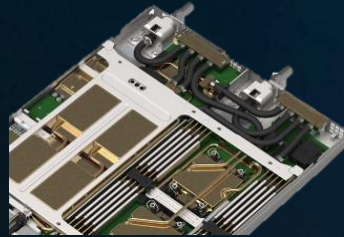


In-rack Cooling Distr. Unit (CDU)

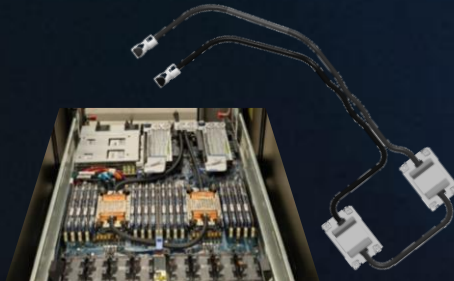


DIRECT WATER COOLING

Full System

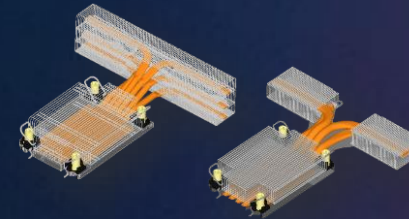


Core System

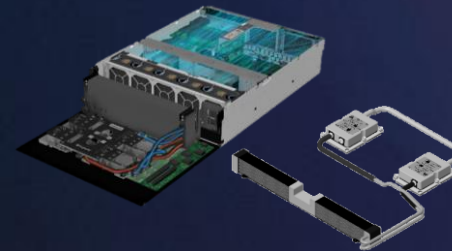


LIQUID ASSISTED COOLING

Thermal Transfer Module (TTM)



Liquid to Air Module (L2A)



LIQUID IMMERSED COOLING

Self-Contained



Fully Submerged



New Generative AI workloads drive massive Compute, Networking, Storage Infra

& Heat!



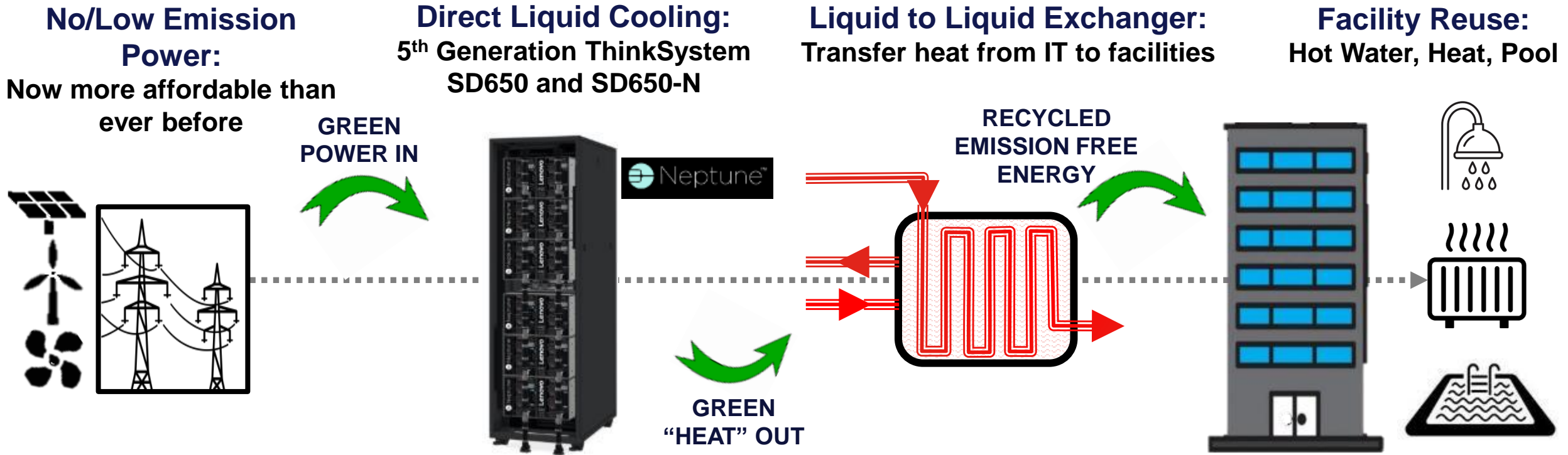
Lenovo ThinkSystem SR670 V2
Lenovo ThinkSystem SR675 V3
for Generative AI Inference



Beyond Carbon Neutral To Carbon Negative

GOAL: Deliver computing that is carbon negative operationally
Requires energy efficiency + green power + energy re-use

More CO2 removed than released



Advancements in sustainable computing help reduce your environmental footprint



CO₂ Offset Services

Carbon offset credits fund projects, including reforestation, renewable energy, and solar



Lenovo Neptune™

Up to 40% reduction in power costs resulting from a 3.5x improvement in thermal efficiencies vs. air cooled



100% Recyclable Packaging

Including the use of 90%+ recycled foam and bags made from 30% ocean bound plastic



Lenovo TruScale™

Avoids over-provisioning, reducing energy consumption for a lower carbon footprint



Factory Integrated Racks

Saving 3.5 million pounds of cardboard and 1.8 million pounds of plastic over 5 years



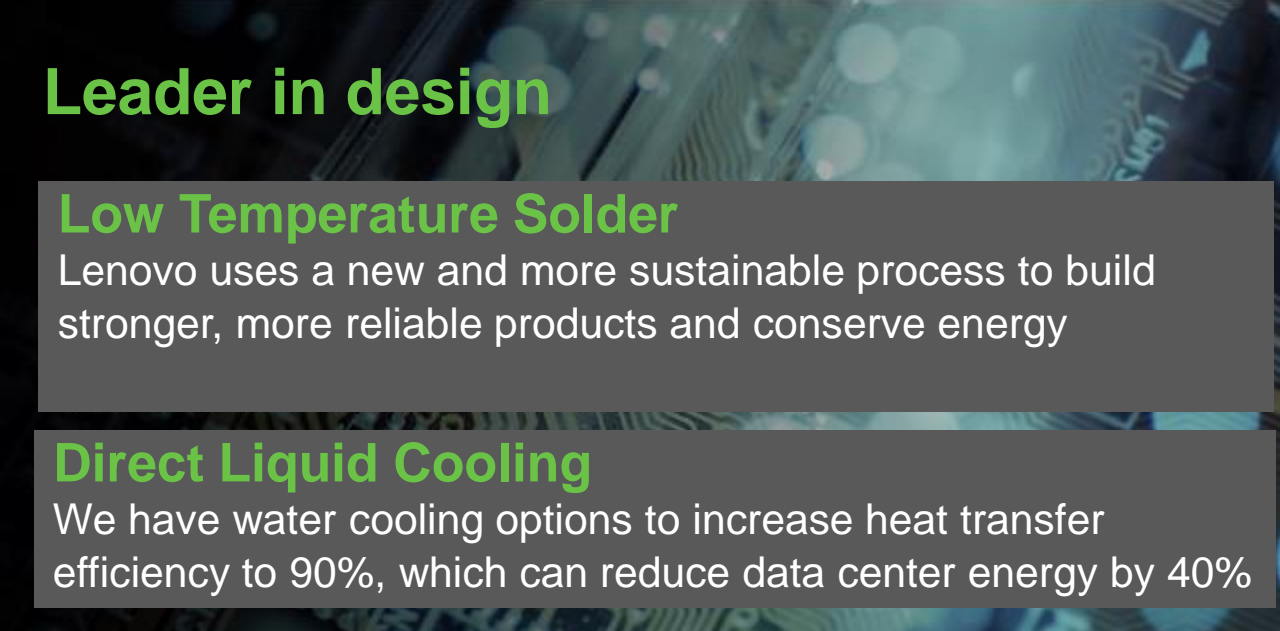
Lenovo Asset Recovery

15 years experience in asset recycling and more than 1M+ assets properly disposed



Leader in innovative packaging

Our lighter bio-based (bamboo and bagasse) packaging reduces the overall package size, resulting in less CO₂ transportation emissions



Leader in design

Low Temperature Solder

Lenovo uses a new and more sustainable process to build stronger, more reliable products and conserve energy

Direct Liquid Cooling

We have water cooling options to increase heat transfer efficiency to 90%, which can reduce data center energy by 40%



A leader in sustainability

CDP Ranking: Leadership Level | UN Global Compact | RBA | RMI |
100 Most Sustainable Corporations in the world | Science based Targets Initiative



Closing the loop

We use post-consumer recycled content in our products and are introducing a closed-loop process for some systems



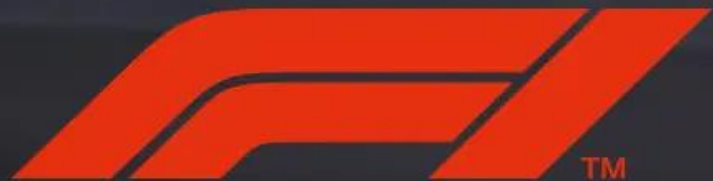
CO₂ Offset Services

Lenovo is the leader in the industry offering CO₂ Offset Services for customers to compensate for CO₂ emissions over the product's lifecycle

Smarter
technology
for all

Lenovo

thanks.



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