

Smarter technology for all

# Lenovo Innovation and Sustainability



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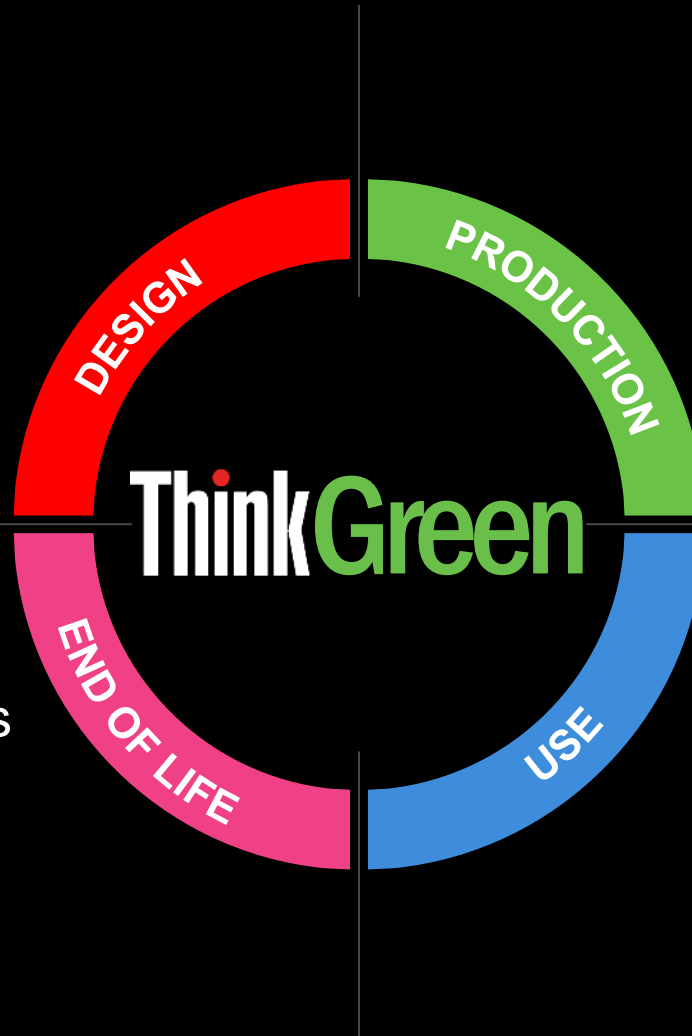
# Taking a Lifecycle Approach to Eco Design

## Design for Environment

- Recycled content (PCC)
- Design for reuse & recycling
- Env. preferable materials
- Energy efficiency
- Carbon footprint

## Product End-of-Life

- Consumer recycling programs
- Asset Recovery Service Offerings
- Recyclable packaging



## Sustainable Manufacturing

- Code of Conduct
- Waste reduction initiatives
- Low Temperature solder
- Supplier environmental performance

## User Experience

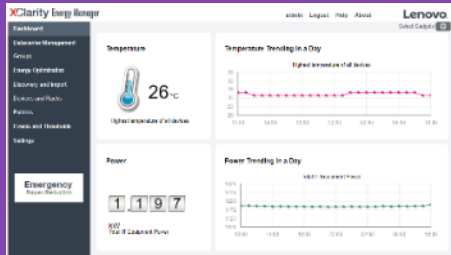
- TCO Certified - ergonomics
- Energy Efficient
- Award-winning quality
- Cooler and quieter
- Repairability

# Lenovo Energy Efficient Infrastructure

## 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

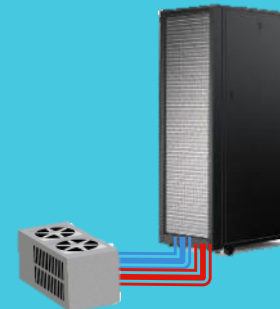
### Low Loss Materials



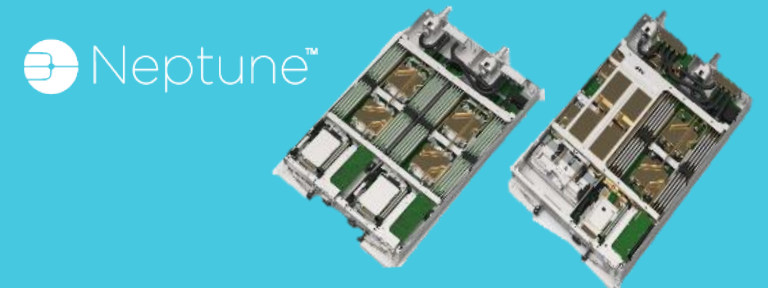
## Liquid Cooling

*Rethink how cooling gets done*

### Rear Door Heat Exchanger



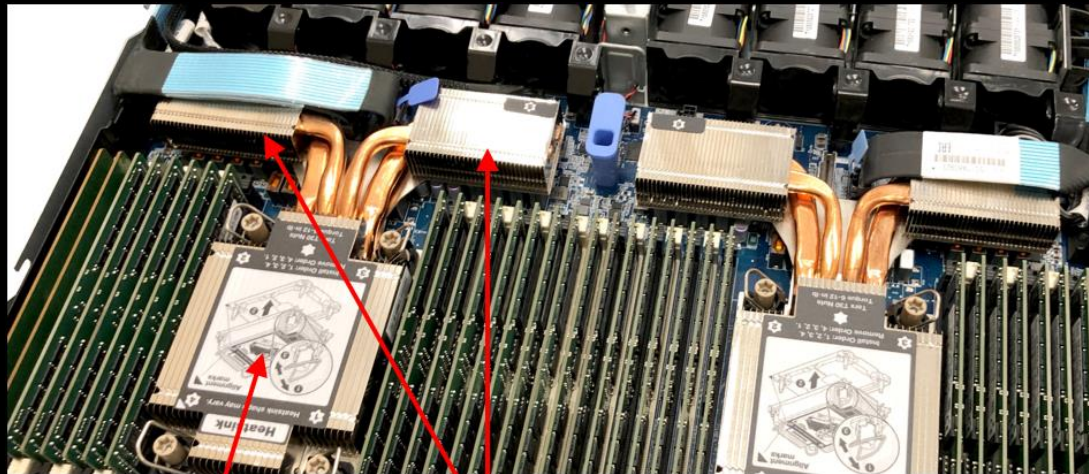
### Direct Liquid Cooled Systems



# Lenovo cooling examples



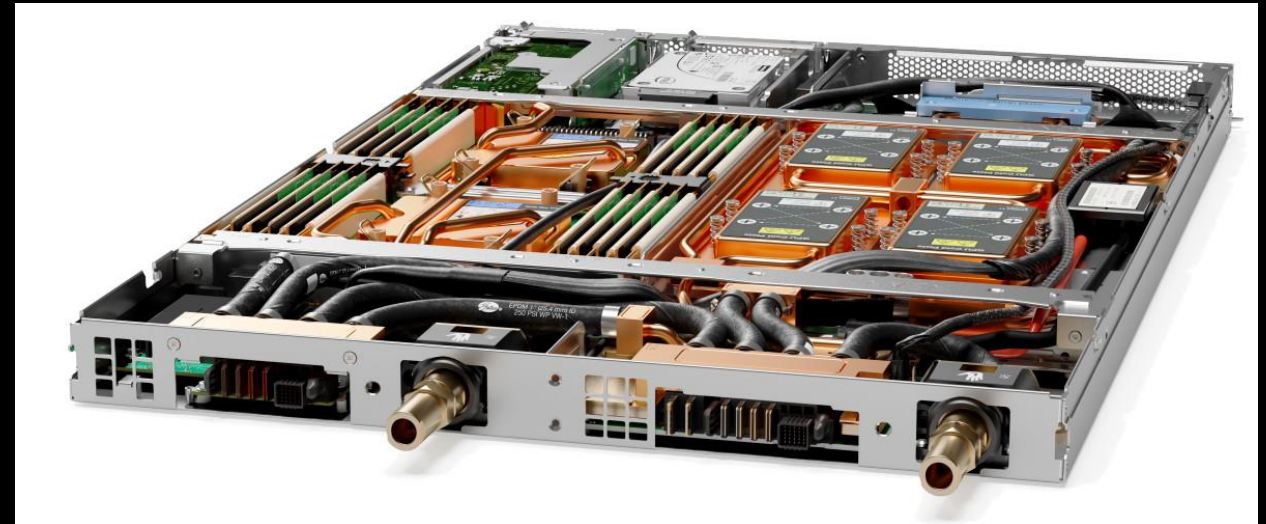
## Closed-loop: 1U SR630 V2 & SR645



Processor  
heatsink

Satellite heatsinks  
connected via heat pipes

## Open-loop: 1U SD650-N V2



# New! **Lenovo & ICC HFT Servers**



INTERNATIONAL  
COMPUTER CONCEPTS

## VEGA HIGH SPEED TRADING SOLUTIONS

International Computer Concepts (ICC) understands what financial services organizations are up against today. Faced with tough competitive realities, increasing regulations and ever-increasing amounts of data, they require a solid IT foundation to meet all their demands.

**HIGH-PERFORMANCE  
LIQUID-COOLED SYSTEMS**

**CLOSED LOOP AND  
MAINTENANCE FREE**

**8-core i9-12900k @ 5.4 GHz**



### Dedicated Overclocking Team

ICC has invested in a dedicated Overclocking Team that has developed ICC Vega, an overclocked solution that achieves the fastest sequential processing speeds on the market. ICC experts have a deep background in overclocking and advanced cooling solutions necessary to achieve the highest performance for your business.



### RAM Optimizations

In cooperation with the industry's top vendors, ICC tested multiple memory kits to deliver the highest bandwidth and lowest latency available. Working with clients, the memory was pushed to meet stringent requirements, lowering CAS latency and the Command Rate. The RAM is run through vigorous stress testing and is offered in up to 128 GB per node and up to 4200 MHz.



### BIOS and Linux Optimizations

ICC channels the thinking of high-frequency traders. We isolate our CPU cores, run them at max performance, and have our own kernel. Hundreds of changes have been made to the BIOS, OS, and hardware for minimum jitter and maximum speed. We understand the HFT workload needs and have pushed our systems to their maximum potential.

# Sustainability Services

Helping customers reaching their environmental targets in a lifecycle offering



# Lenovo CO<sub>2</sub> Offset Service Solution

Seamless process to reduce your environmental impact with tangible proof of CO<sub>2</sub> emission offset



**Easy to implement** included in hardware transaction

Lenovo IT equipment: **Best in class** low environmental footprint



CO<sub>2</sub> compensation is based on **realistic emission by product**,

- Production
- Shipment
- Typical 5-year life-cycle for *new and existing Lenovo devices*



CO<sub>2</sub> emission offset administered by **certified and recognized** leader in environmental commodities

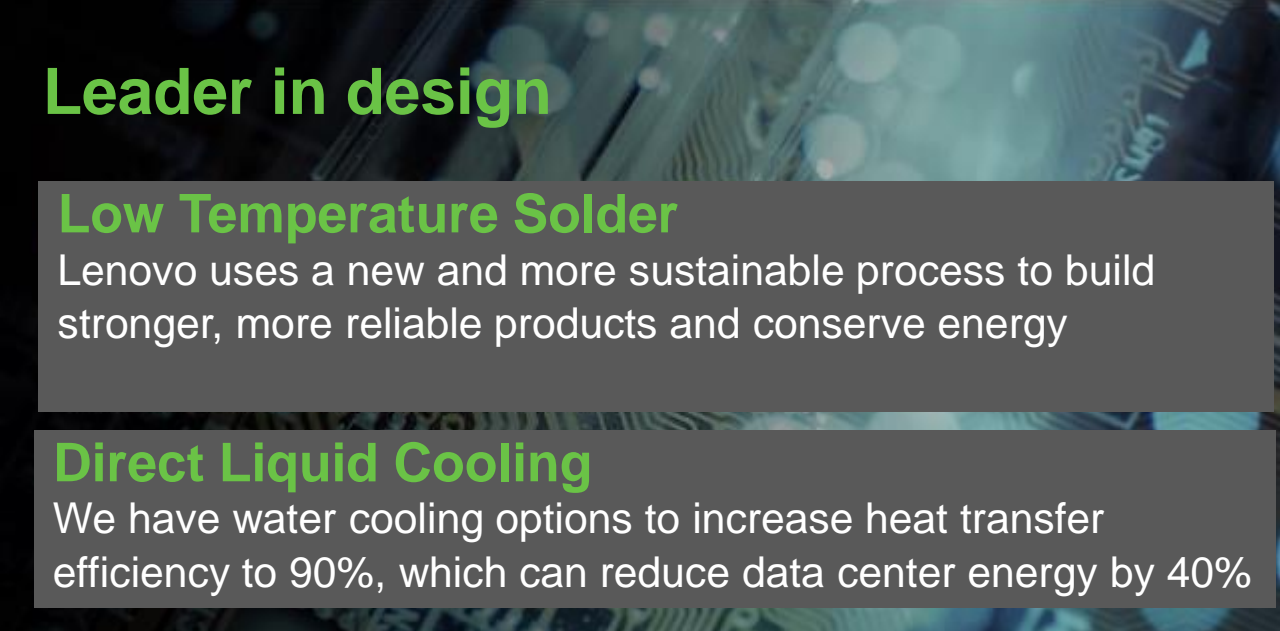
Lenovo's CO<sub>2</sub> Offset Service is 3<sup>rd</sup> Party **validated by DEKRA**

Certificates are provided by our WW Partner **ClimeCo®**



## Leader in innovative packaging

Our lighter bio-based (bamboo and bagasse) packaging reduces the overall package size, resulting in less CO<sub>2</sub> 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

## CO<sub>2</sub> Offset Services

Lenovo is the leader in the industry offering CO<sub>2</sub> Offset Services for customers to compensate for CO<sub>2</sub> emissions over the product's lifecycle



# Keep Calm And...



Smarter  
technology  
for all

Lenovo

thanks.