Open. Together.

OCP SUMMIT

Liquid Cooling Trends

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Microsoft

Advanced Cooling Solutions (ACS)

Project Wiki with latest specification:
https://www.opencompute.org/wiki/Rack_%26_Power/Advanced_Cooling_Solutions

ACS Door Heat Exchange

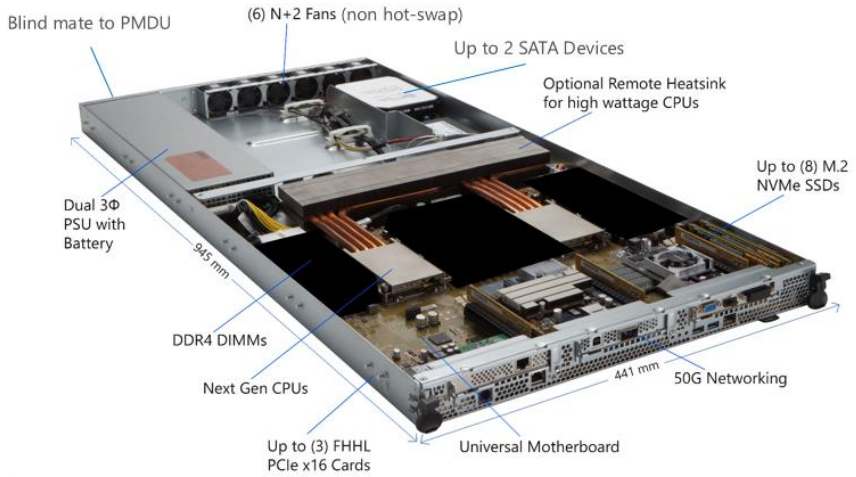
ACS Cold Plate

ACS Immersion Cooling

Please join the group and help develop the harmonization standards that will enable advanced cooling solutions for Open Compute solutions.

Olympus Today

- Front to Rear Forced Convection Air Cooled
  - Air Cooled Power Supplies
- Remote Heatsink with Heat Transport through Heat Pipes
- Capable of cooling over 1kW in 1RU
- Power density of the chips and/or fan power consumption present limitations to the thermal solution.



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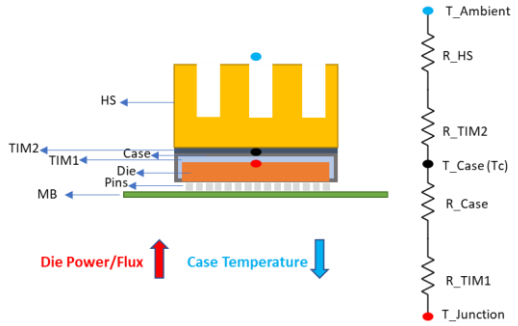
Agenda

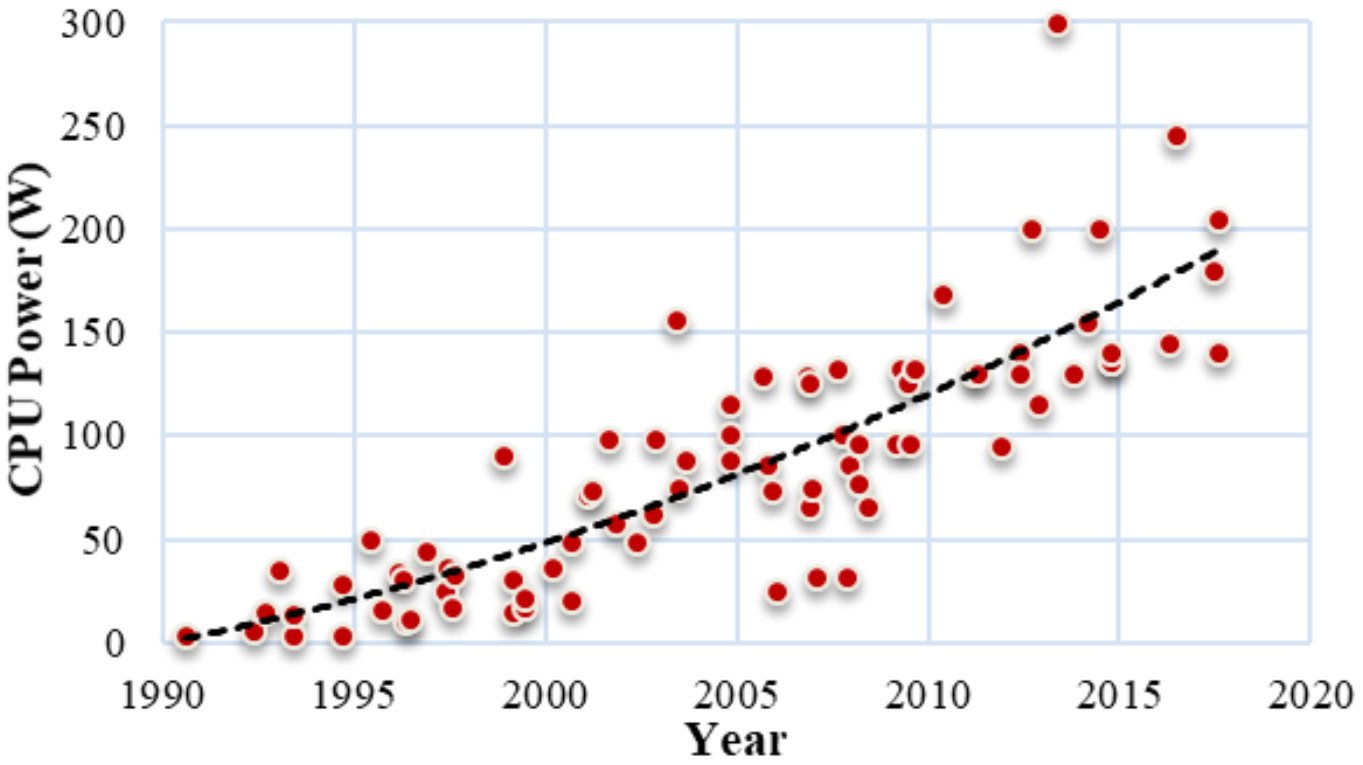
ACS

- Chip Technology Trends
- Chip to Data Center Motivation
- Olympus, a liquid cooling friendly server:
  - Direct Attached-Microchannel cold plates (Hybrid)
  - Single Phase Blade Immersion
  - Single Phase Bath Immersion
  - Two Phase Bath Immersion
  - Other Techs
- OCP ACS
- Recommendations

Trends: Chip Power and Temperature Requirements

CPU Trends

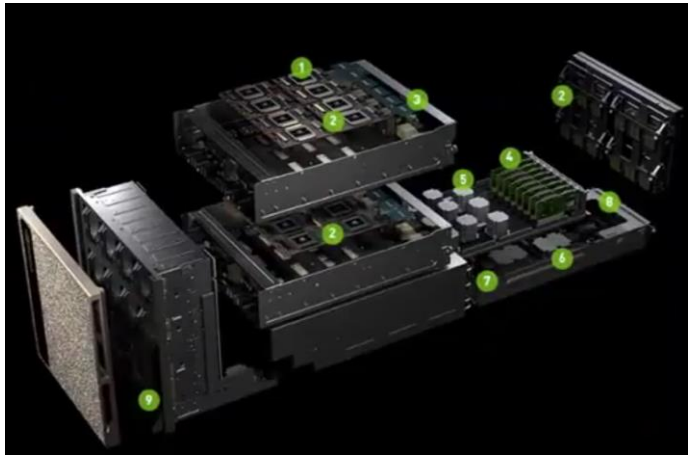




GPU Trends

Nvidia V100 300 W

MSFT G50 Expansion 4 kW



Nvidia DGX-2, 10 kW

Holistic Chip to Data Center Motivation

ACS

Enables Density

Future trend processors

Reduce footprint

TCO

More Efficient

Lower PUE

4000x thermal capacity compared to air

Enables Energy recovery

Reduction in water use

Climate agnostic

Competitive advantage

Enabling future CPUS, FPGAs, GPGPUs and other architectures (>300W/chip)

Simplifies and improves interconnects

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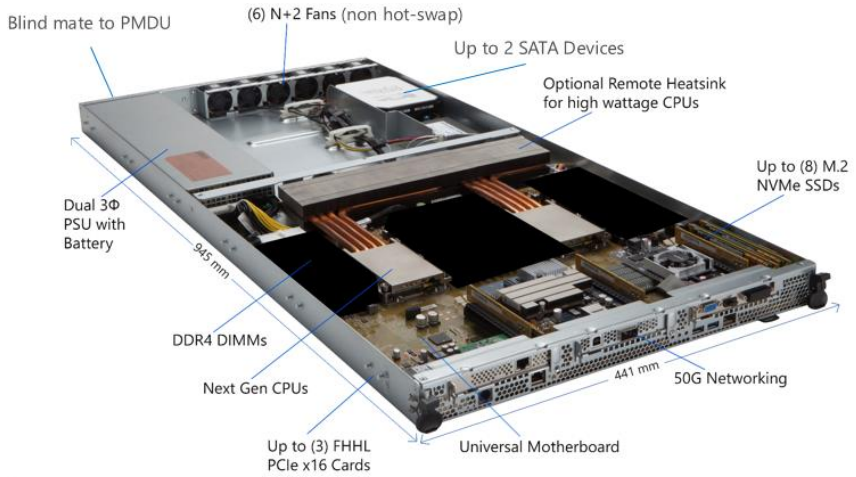

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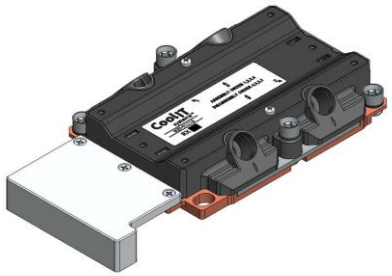
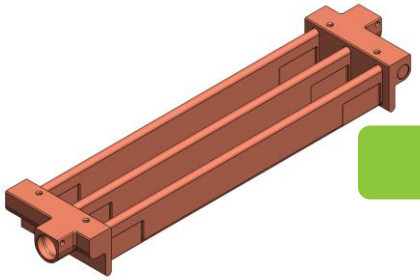
Direct Attached-Microchannel cold plates (Hybrid)





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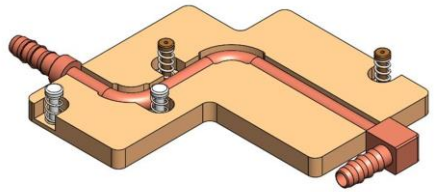
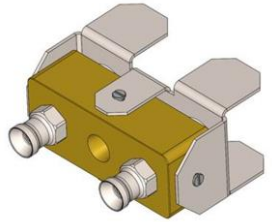
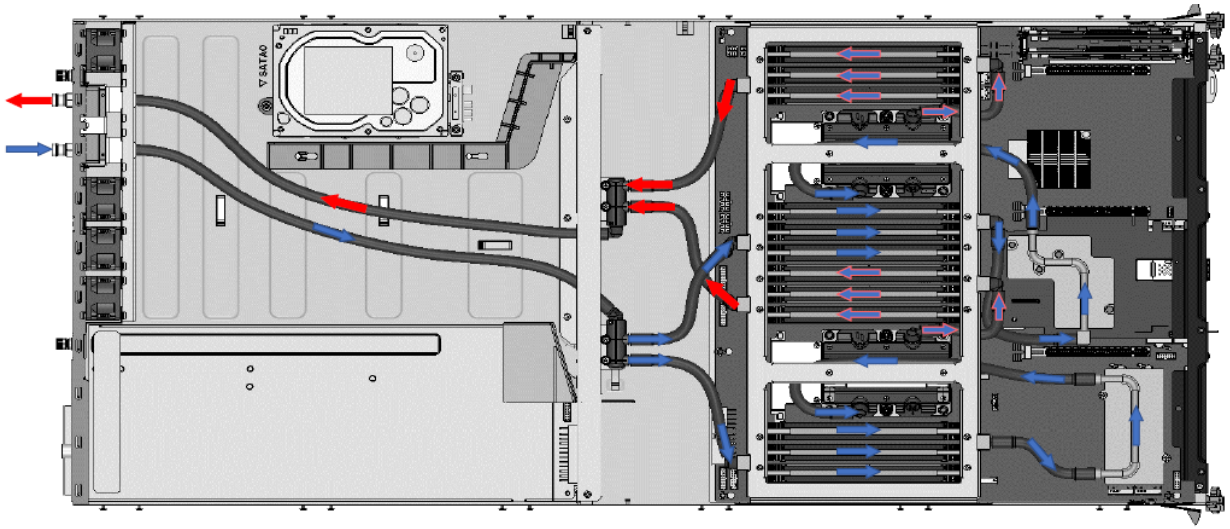
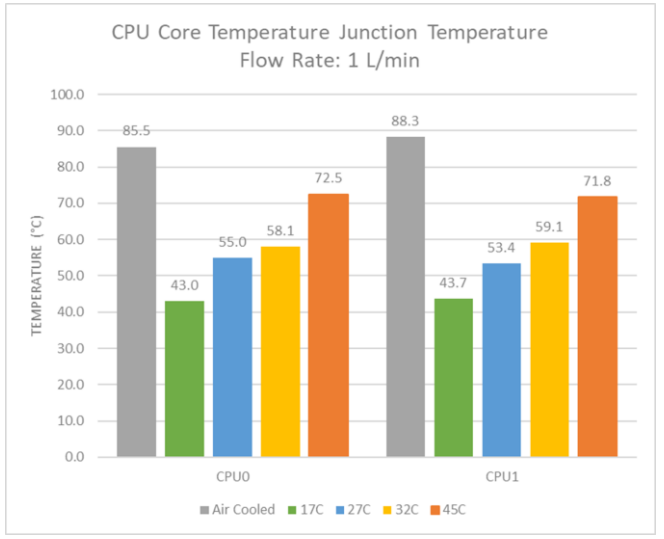
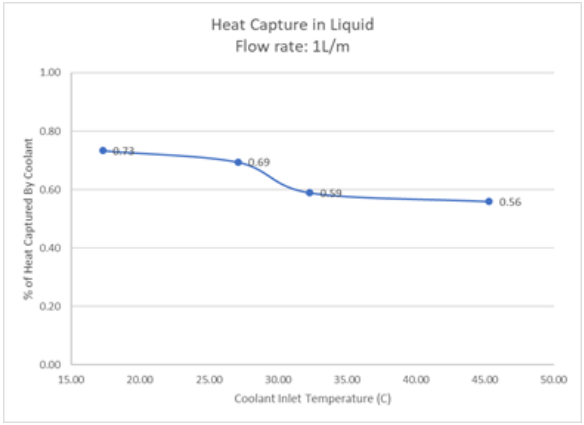


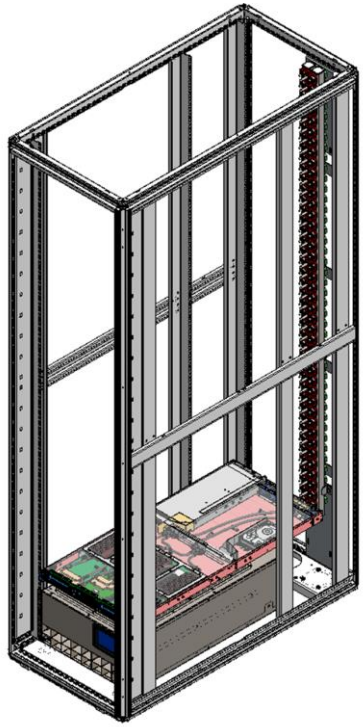


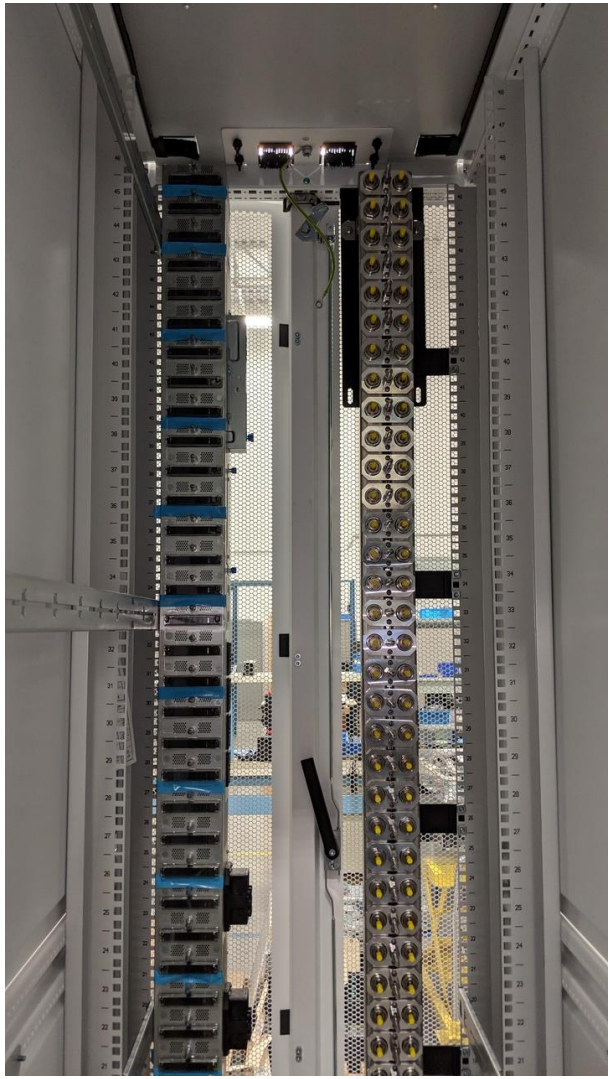






Direct Attached-Microchannel cold plates (Hybrid)





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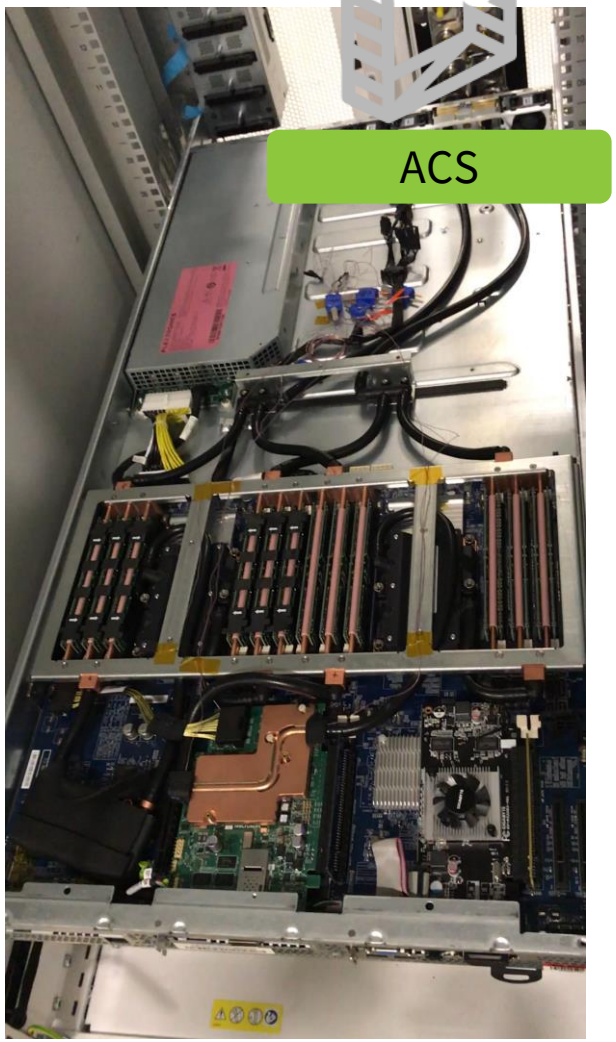
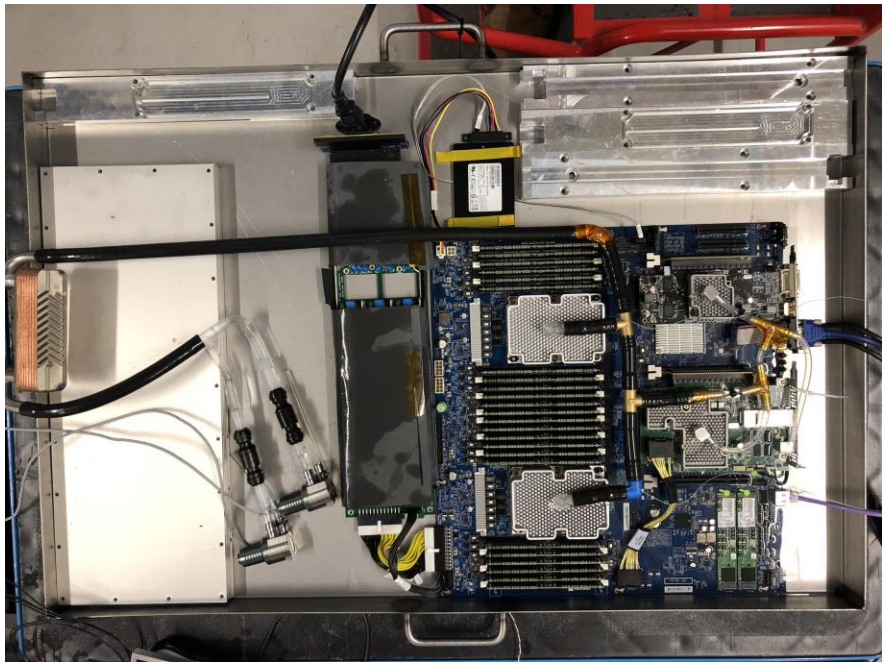
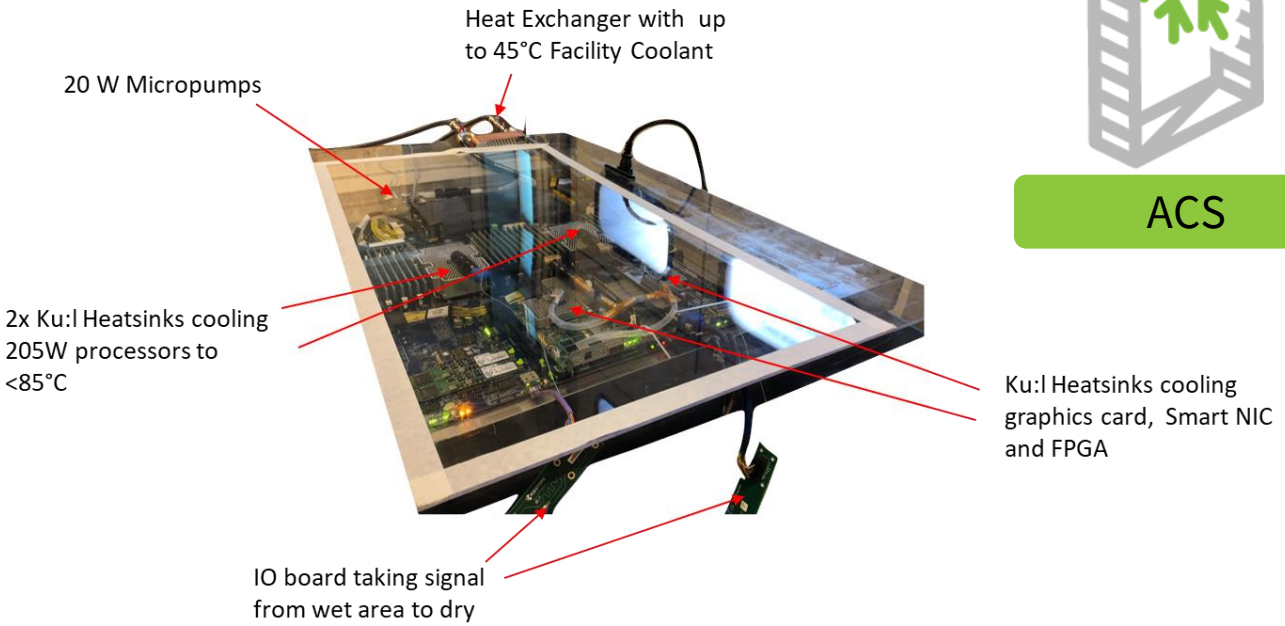


Single Phase Blade Immersion





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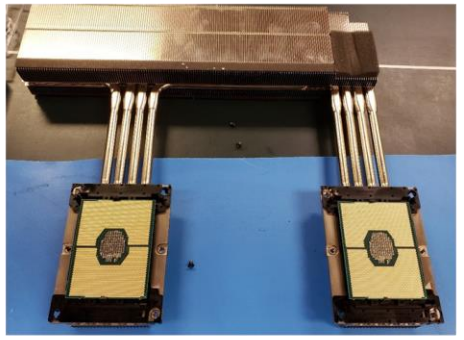
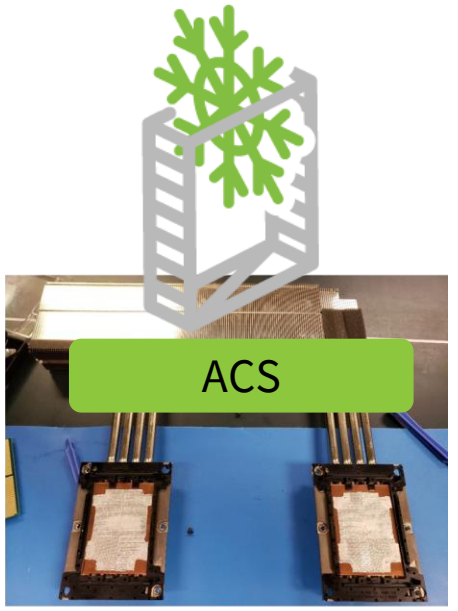
Single Phase Bath Immersion

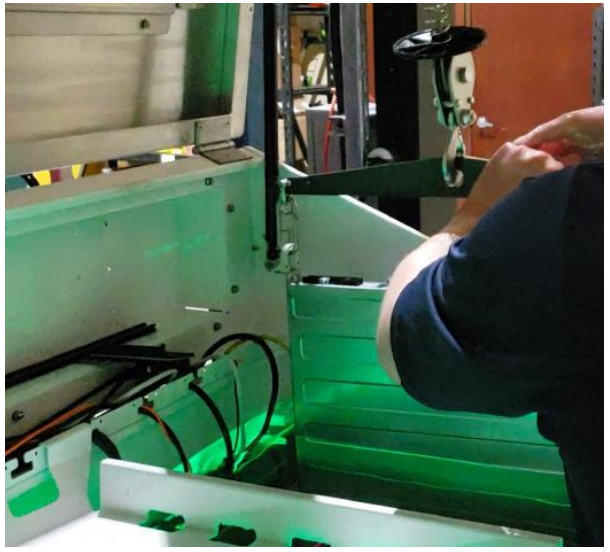
1. Heat Sinks pulled



2. CPUs removed

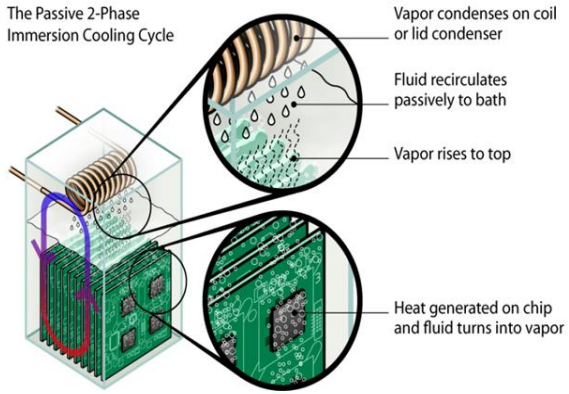


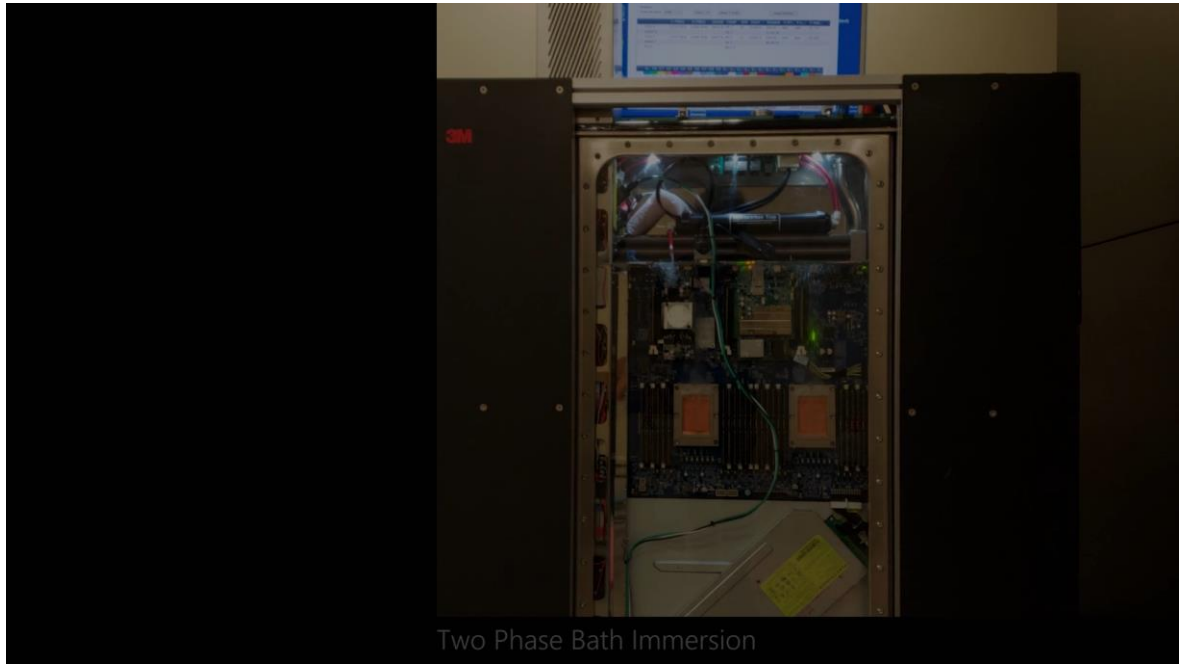
3. Previously installed indium foil removed & heat sinks reinstalled, bare chip to heat sink contact



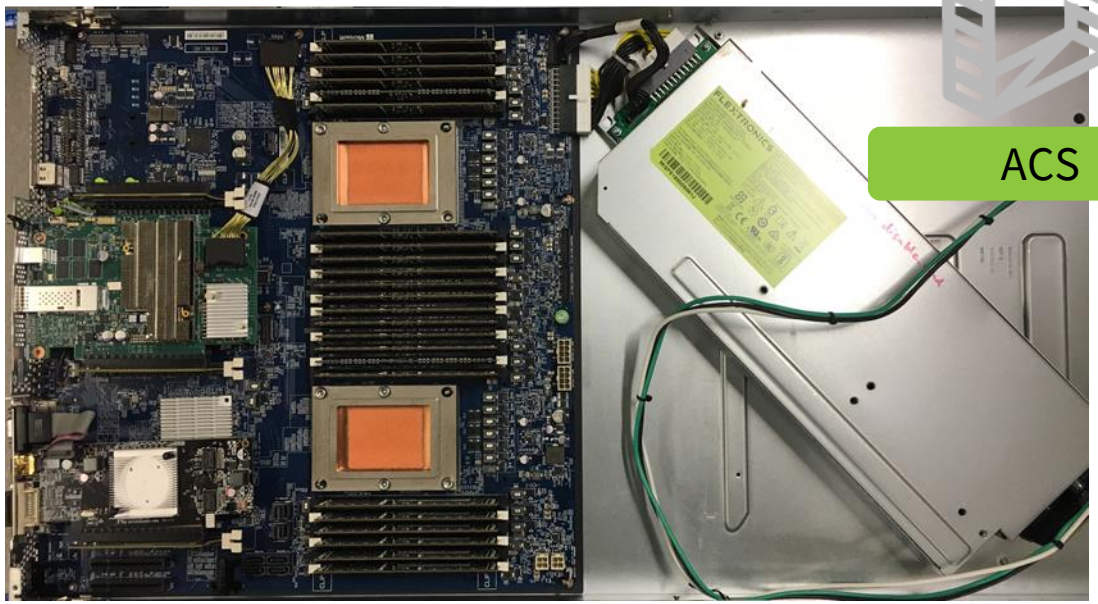
Indium foil TIM2

Two Phase Bath Immersion





2P Immersion cooled Gen6



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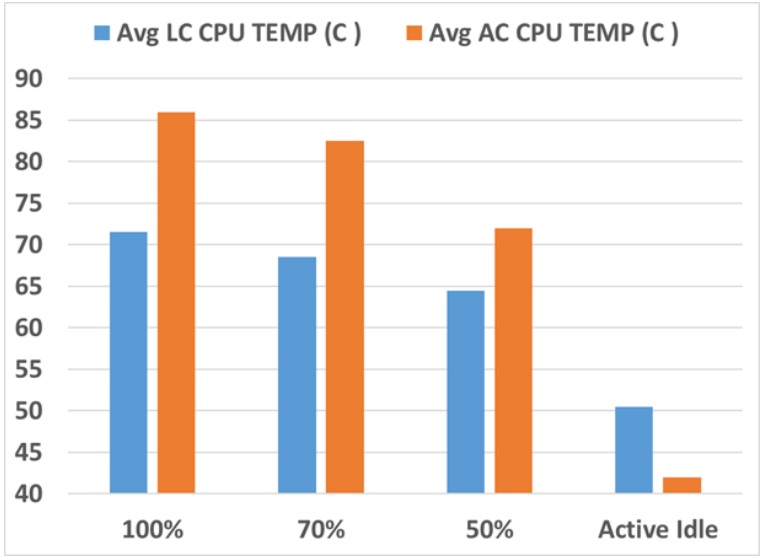

Project Olympus

- The expansion of the Project Olympus platform will help to further broaden the range of potential uses for the platform.
- Microsoft and our development partners are displaying the hardware at the OCP conference for cloud-based platform review and evaluation.
- More standardization
- Less proprietary more commoditized

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