Open. Together.
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.
Agenda

• 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

**Nvidia V100 300 W**

**MSFT G50 Expansion 4 kW**

**Nvidia DGX-2, 10 kW**

**CPU Trends**
Holistic Chip to Data Center Motivation

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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Direct Attached-Microchannel cold plates (Hybrid)
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Single Phase Blade Immersion

- 20 W Micropumps
- 2x Ku:U Heatsinks cooling 205W processors to <85°C
- Heat Exchanger with up to 45°C Facility Coolant
- Ku:U Heatsinks cooling graphics card, Smart NIC and FPGA
- IO board taking signal from wet area to dry
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

ACS

- Vapor condenses on coil or lid condenser
- Fluid recirculates passively to bath
- Vapor rises to top
- Heat generated on chip and fluid turns into vapor
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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