

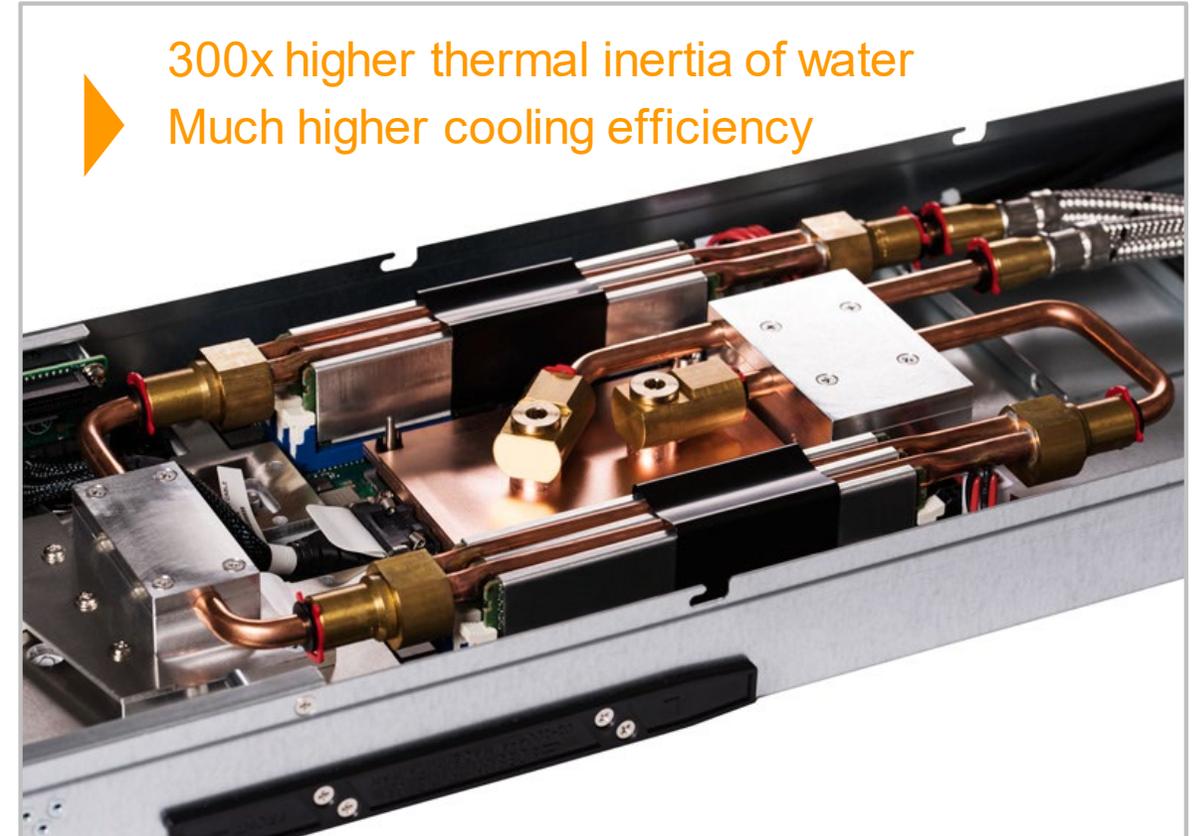


„CoolMUC-3“ A Direct Warm Water Cooled HPC System

Leibniz Supercomputing Centre and MEGWARE

Direct Warm Water Cooling

- Water-carrying heat sinks are cooling all hot components such as
 - ✓ CPUs
 - ✓ Memory
 - ✓ Voltage regulators
- Advantages
 - ✓ Year-round free cooling
 - ✓ Waste heat reuse for heating of buildings (winter)
 - ✓ Waste heat reuse for chilled water production by adsorption chiller (summer)



But: Components such as power supplies and network switches are typically still air cooled!
→ Warm water cooling efficiency of only 75% - 85% (strongly depending on ΔT between room and water temperature)

Challenges

- Further reduction of operational costs
 - ✓ Operation of system without air or chilled water cooling
 - ✓ Thermal isolation of racks
 - ✓ Improvement of options for waste heat reuse
 - Water inlet temperature of 55°C

Procurement requirement

At least 97% of system waste heat must be discharged by direct warm water cooling

MEGWARE Solution

- Direct water cooled power supplies
- Direct water cooled Intel OmniPath switches
- Thermal isolation of racks



148 Compute Nodes

- Intel Xeon Phi 7210-F
- 96GB DDR4
- 16GB HBM
- 2x100Gbit/s OmniPath

10 48-port OmniPath Switches

3 MEGWARE SlideSX-LC Racks

- 100% warm water cooled
- 5 Chassis per rack
- 10 compute nodes per chassis



1 Air Cooled Rack

- Electrical power consumption < 1%
- 2 management nodes
- Ethernet switches



Only one cooling circuit needed (warm water cooling circuit)

- Less complexity
- Less investment costs



Year-round free cooling

- Higher energy efficiency
- Less operational costs



Service reduced



Very reliable



Ease of waste heat reuse

Not only for HPC!
