ICEOTOPE
DEPLOY | SUSTAIN | RECAPTURE

Cooling & Powering ExaScale

12/5/16

A Long Recognised Challenge

Cooling and Powering supercomputers effectively is a long-recognized problem.

Seymour Cray cited "*the thickness of the wiring mat and getting rid of the heat*" as key challenges in supercomputer design.

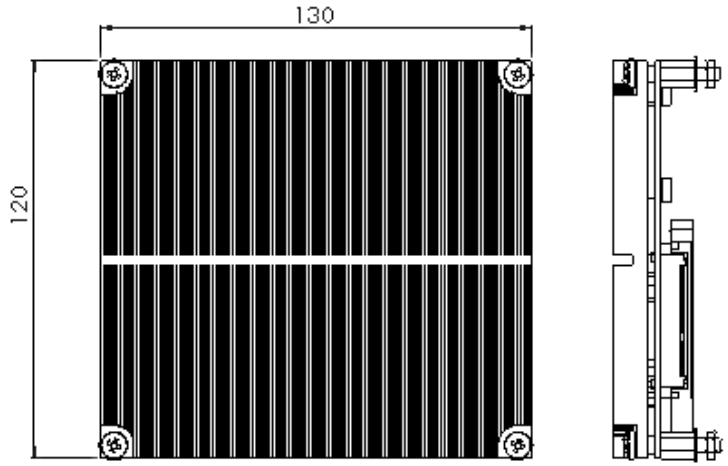
What Does That Mean Today?

- The “Wiring Mat”
  - Interconnect
  - Power Delivery
- Getting Rid of the Heat
  - Liquid Cooling
- (New Factors) Failure Domain, Scalability and Serviceability

Challenges

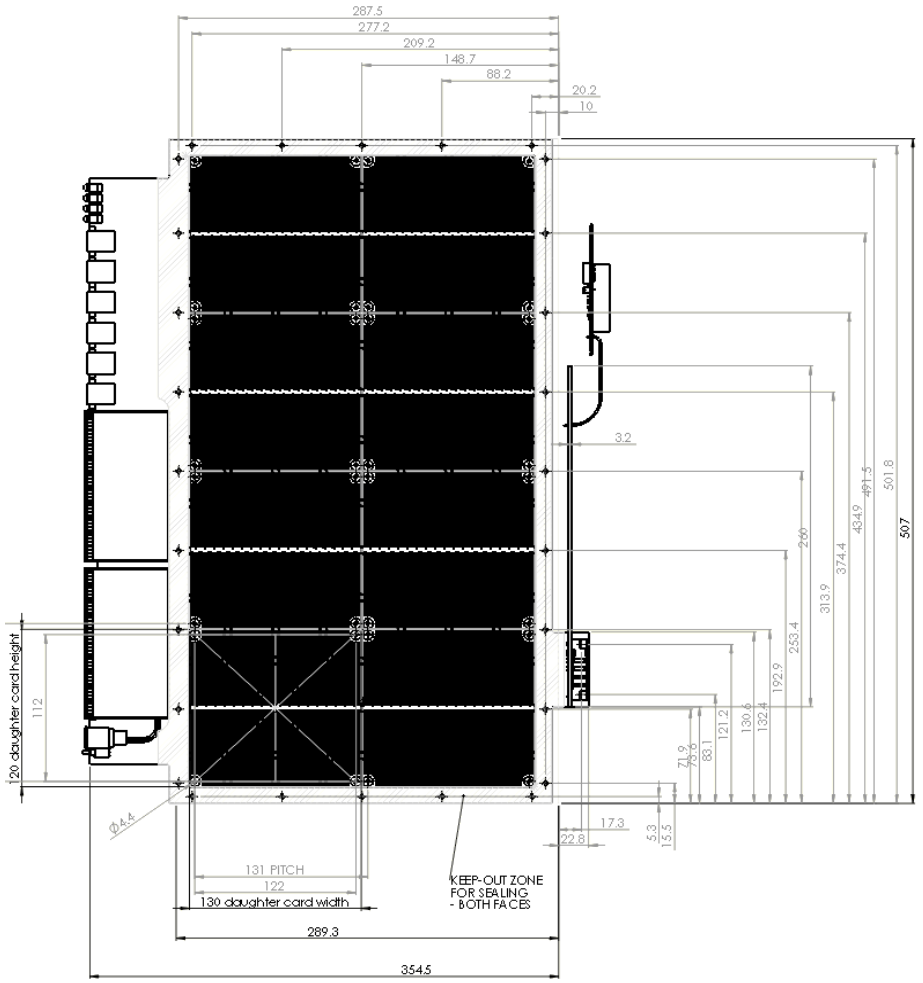
- Increasing Density of Equipment
  - Denser equipment reduces overall “wiring mat” by volume
  - However number of links per sqft increases, just link distance decreases.
  - Short links can be copper (cheap), long links must be optical
- Energy Efficiency
  - 45C inlet water cooling can improve overall energy efficiency by 30% and reduce CapEx
- Reliable & Efficient Power Delivery
  - 48V DC to POL improves power delivery (efficiency or wire size) 16x vs 12V DC to POL
  - High density liquid cooled power conversion (up to 500kW of power conversion in a dedicated cabinet)
- Minimise Failure Domains & Enable Serviceability
  - Large failure domains can impact scalability

ExaNest Stage 1

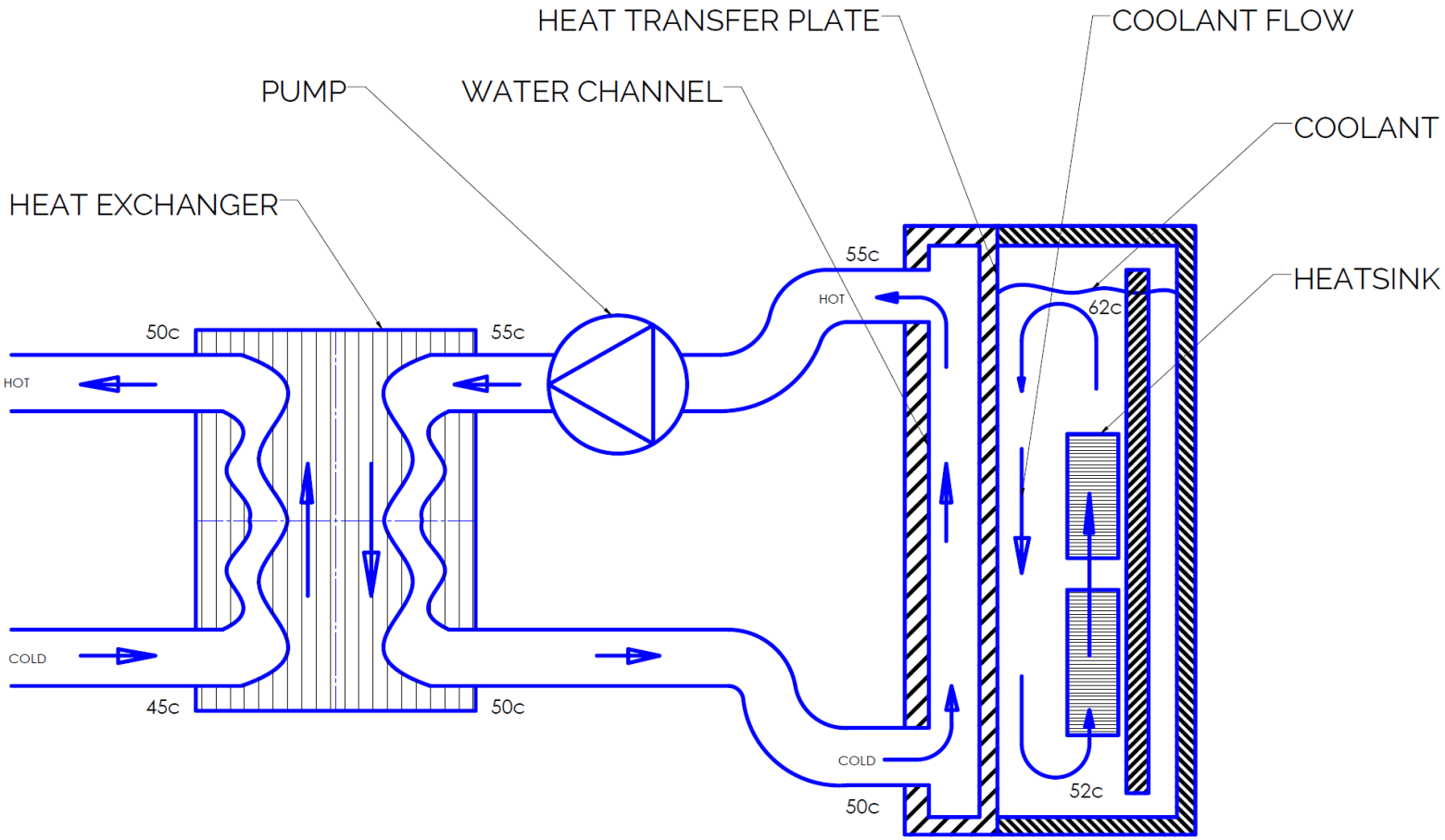


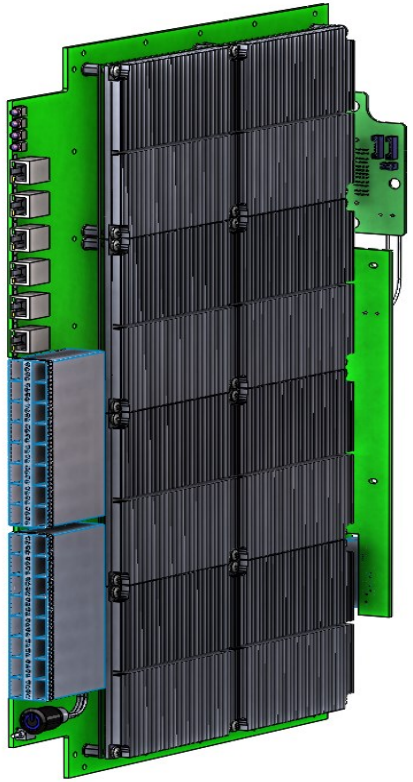
Daughter Card

x8

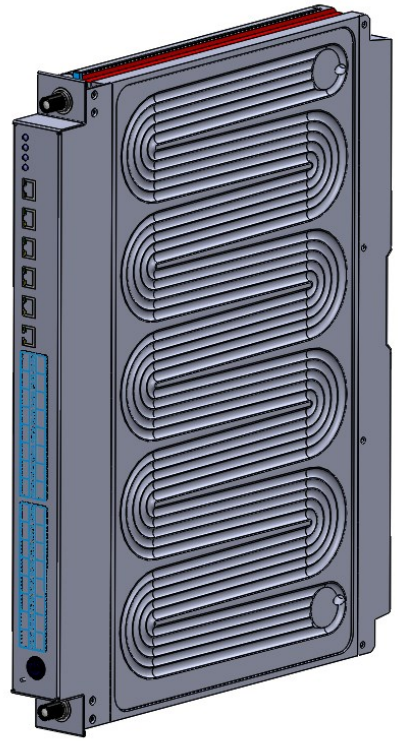


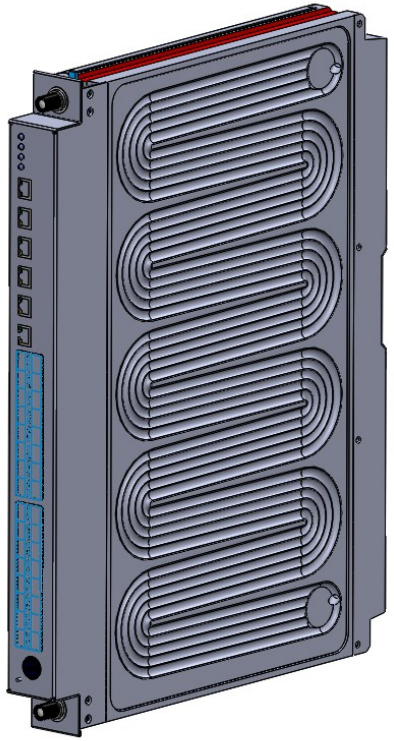
Blade


HEAT TRANSFER PLATE
COOLANT FLOW
PUMP
WATER CHANNEL
COOLANT
HEAT EXCHANGER
HEATSINK
55c
HOT
62c
50c
55c
HOT
COLD
45c
50c
COLD
50c
52c



+ Cooling Cell





Up to 72

(project proto unit will be up to 36, half height)

Stage 2 Targets

- “Double Sided, Double Density” Blades
- 16x Daughter Cards per blade
- 6x Blades + 1 or 2 Switches per chassis
- 12x Chassis per 1200x600 Cabinet
- 1,152 Daughter Cards per Cabinet

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