



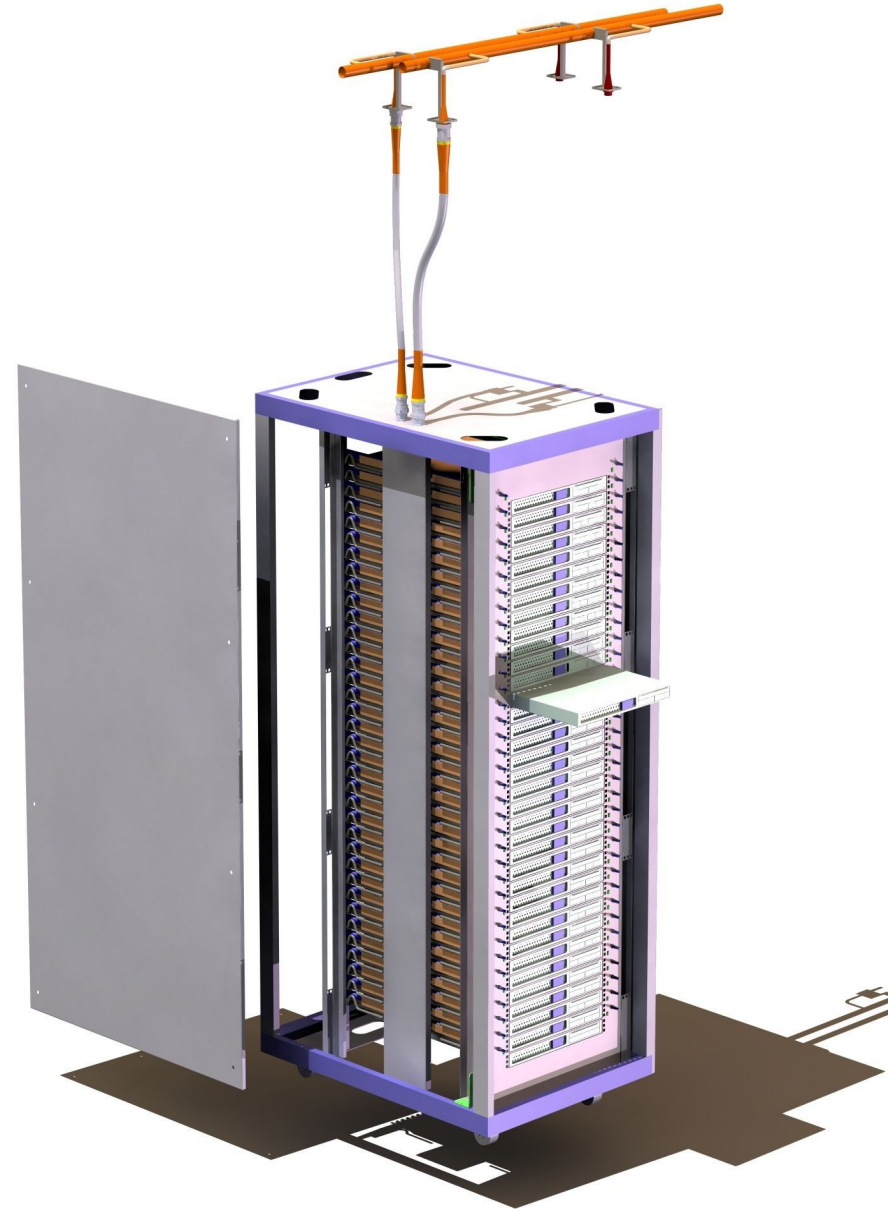
# Fanless Server Track Results

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# Definition

- Investigating alternative data center cooling methods other than convention air
- Specifically in relation to cold plate technology as developed by Clustered Systems



# Discussion Breakdown

- **Emerging technology**
  - > No framework to use for adoption path
- **Questions surrounding optimizing usage**
  - > Blade servers vs 1U servers
  - > Where is heat generated: CPU, Memory, Disk?
  - > What is optimal temperature for top plate for highest efficiency?
  - > How does it work with different temperatures / zones / areas?
  - > Learn from legacy technologies: Cray's, mainframes, chilled cabinets
- **How can it be applied to devices within a datacenter?**
  - > Integrated in new servers / retrofit kit for legacy systems
  - > Storage devices? Network devices?

# Opportunities

- Potential to use free cooling in most climates
  - > Estimating savings of 33% to 50% of total infrastructure power use (assuming PUE 1.5+) If server fans are included with PUE metric – removal lowers overall PUE
- Server Benefits
  - > Higher power densities since heat does not need to be rejected to air
  - > More compute real estate for hardware per system with removal of fans
  - > Fan less data center would be silent!
- Less costly than full facility remodel/build
- Retrofit data centers to support high density
- Fully integrated container would be ideal, especially if deployed with sister support module

# Recommendations & Next Steps

- Standardize on a 'thermal interface' between cooling equipment and heat generators (servers). This will allow different solutions to the cooling problem (coolant vs water vs other), and encourage innovation. Thermal interface could be specified in terms of BTU/hr and temperature range
- Leverage ASHRAE TC9.9 to develop and publish standards
  - > Also to be vetted through LEED, Labs21....
- Review Clustered Systems cold plate technology used during the Chill Off 2 – in reference to problems with Spray Cool issues during Chill Off 1

# Future State



# Next Steps

- Obtain additional Data Center Pulse community input
- Engage with DoE
- Identify Asian and European partners (equivalent of DoE)
- Identify and engage other potential partners
- Determine an area of opportunity for certification in the data center