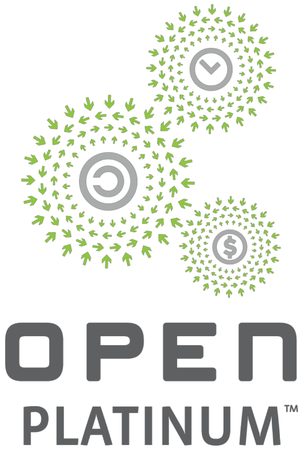
Open. Together.

OCP
SUMMIT

ACS Door Heat Exchanger Concepts/Specification Update

John Fernandes, Thermal Engineer, Facebook



Overview of ACS Sub-Project

ACS

Goal: Enabling advanced cooling in Open Rack and EIA310 architectures

Standardization/definition of

- Critical interfaces
- Operational parameters
- Environmental conditions

Enable a non-proprietary, multi-vendor supply chain of cooling solutions

Specifications

Work Streams in ACS

ACS

Cooling architectures scoped

- Cold plate
- Immersion
- Door Heat Exchanger

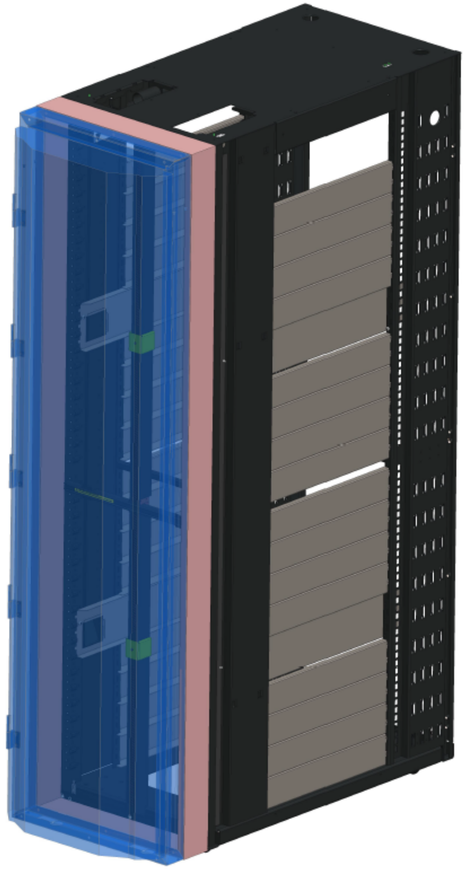
Architecture harmonization: Consistency, materials, DC interfaces, etc.

Specifications

Door HX Work Stream

In-scope activities

- Fluid physical properties and types
- Operating conditions and parameters
- Metrology of heat extraction performance
- Definition of different solutions
  - Data centers equipped with facility water
  - Data centers employing free-air cooling only

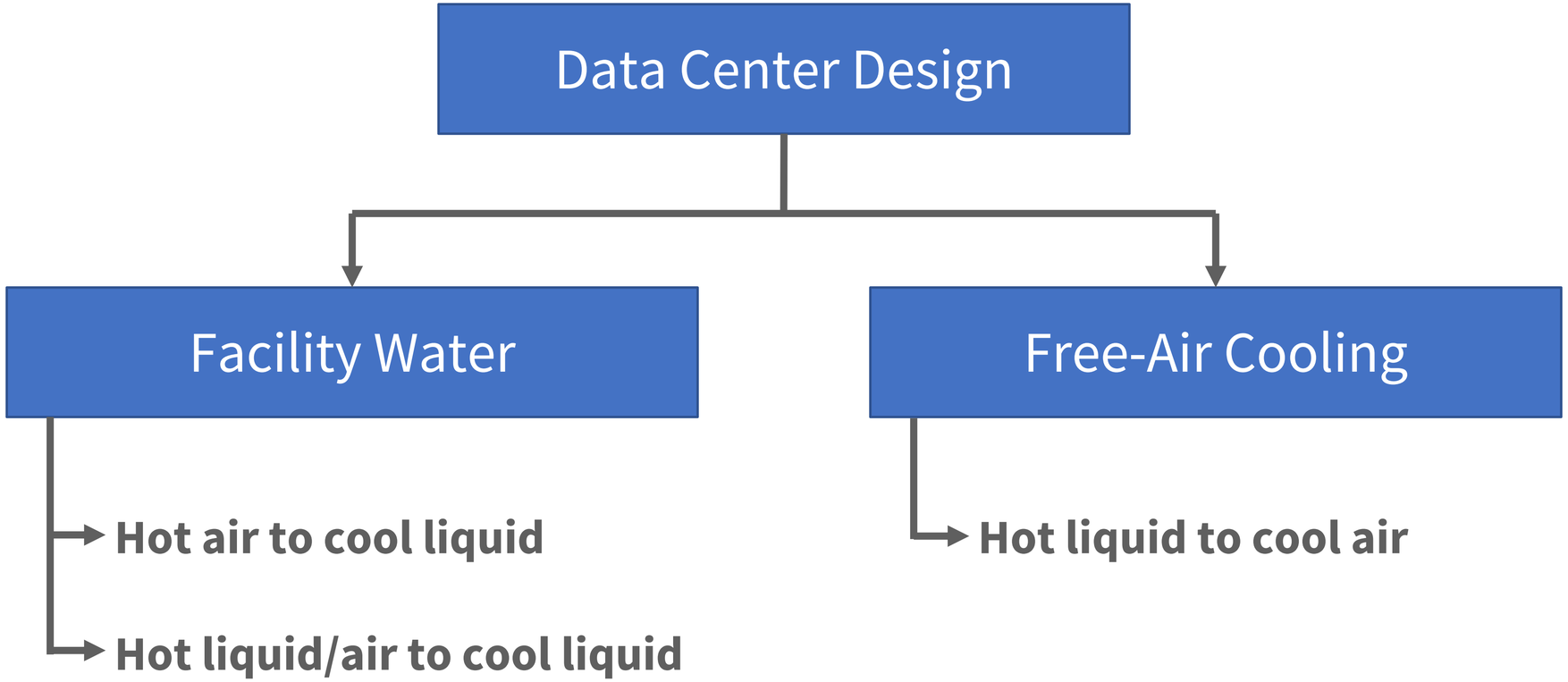


Door HX mounted to ORv2

ACS

Specifications

Overview of Solutions



ACS

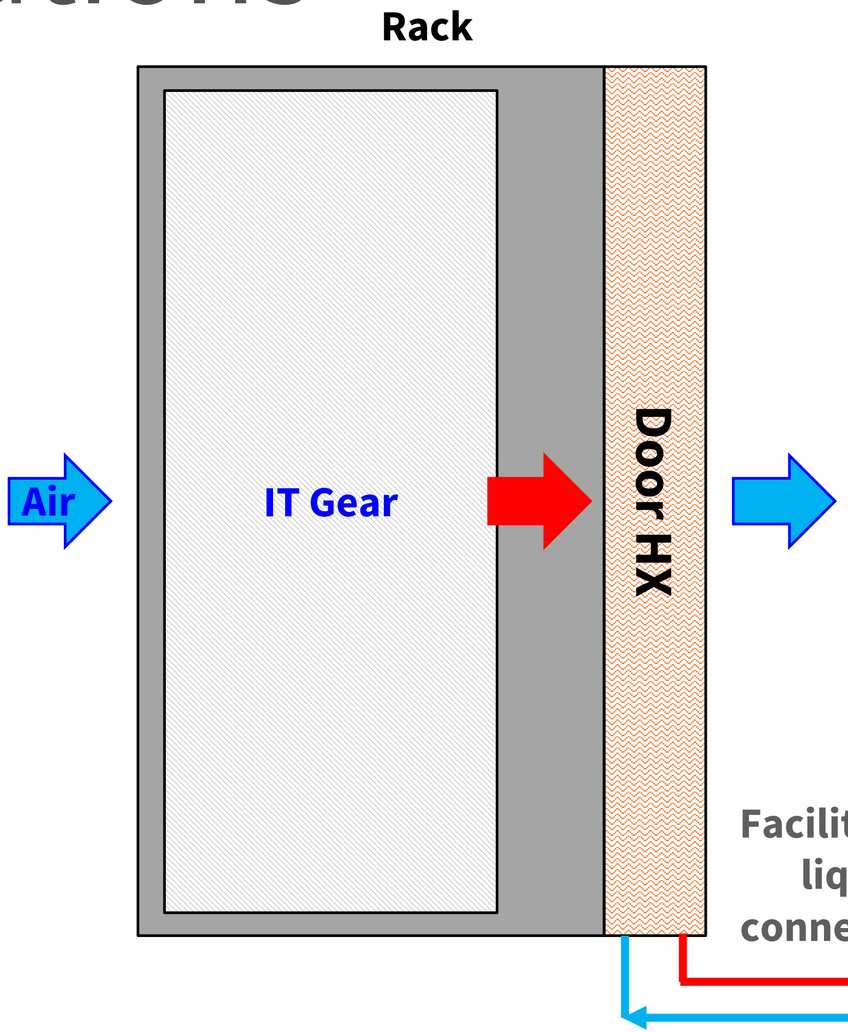
Specifications

Overview of Solutions

Data Center Design

Facility Water

- Hot air to cool liquid
- Hot liquid/air to cool liquid



ACS

Specifications

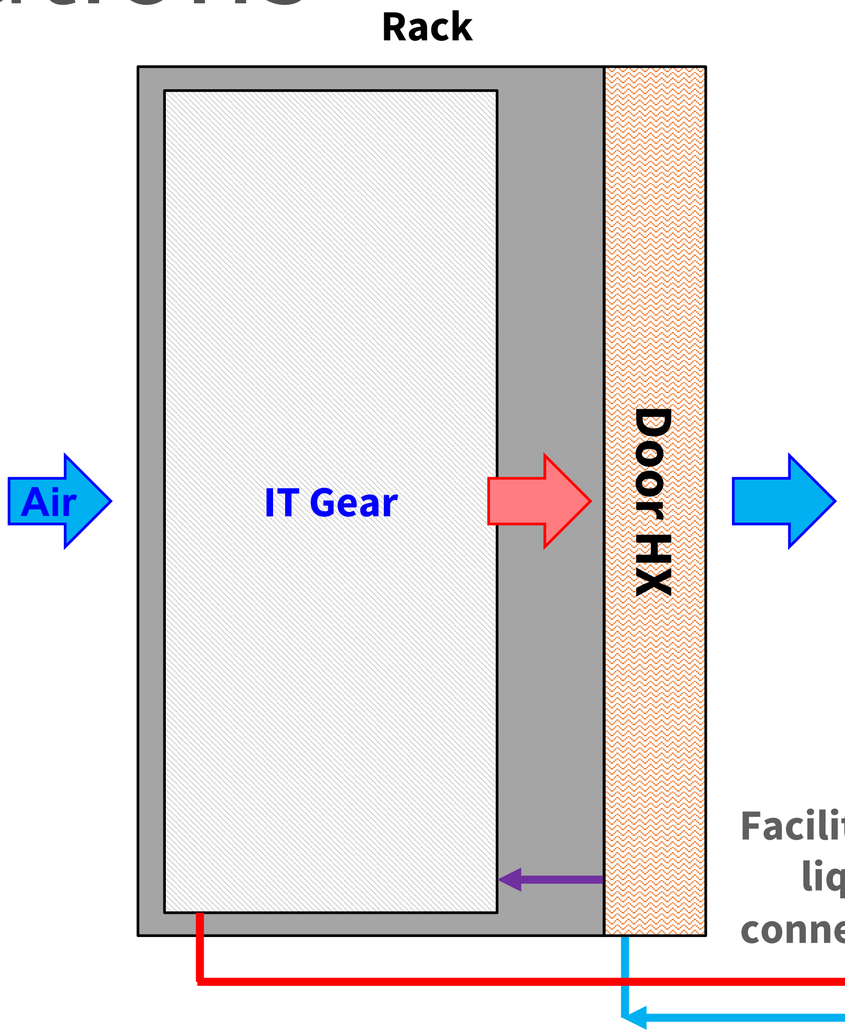
Overview of Solutions

Data Center Design

Facility Water

Hot air to cool liquid

Hot liquid/air to cool liquid



ACS

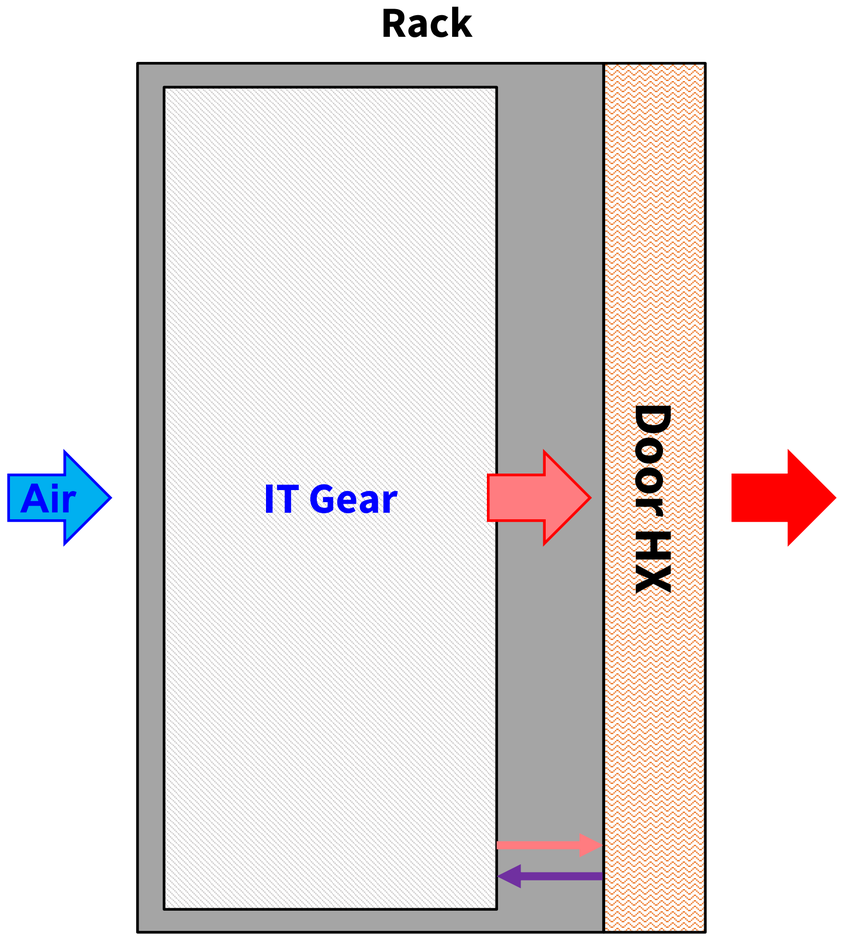
Specifications

Overview of Solutions

Data Center Design

Free-Air Cooling

Hot air to cool liquid

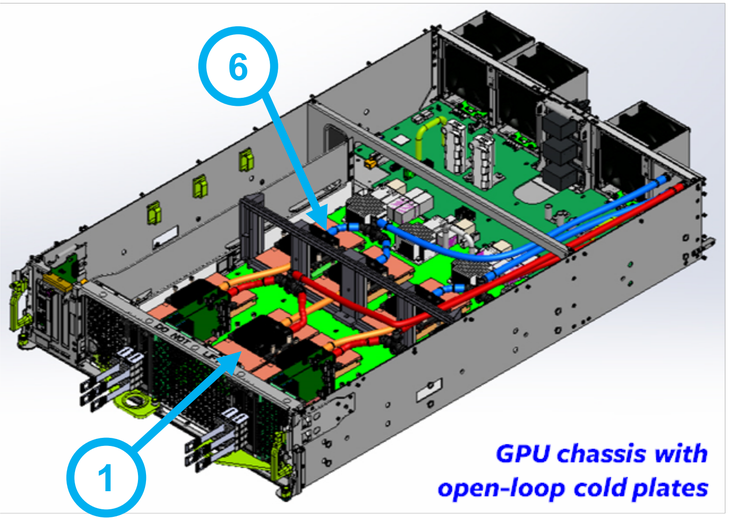


ACS

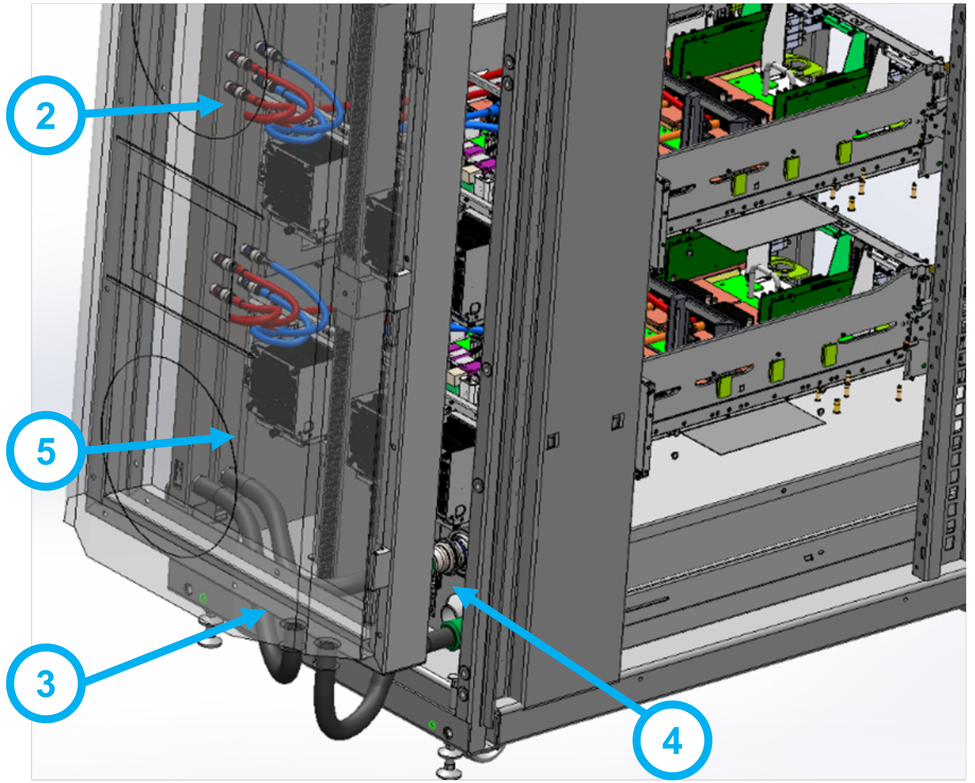
Specifications

Hybrid: Closed-Loop

Cold plate → Hot manifold → Door Hx → CDU → Cold Manifold → Cold plate…



GPU chassis with open-loop cold plates



Connections between manifolds, Door Hx and CDU

ACS

Specifications

Specification

Physical

DC Environment

Performance / Metrology

Monitoring & Control

Serviceability

Reliability & Quality

Environmental & Regulations

ACS

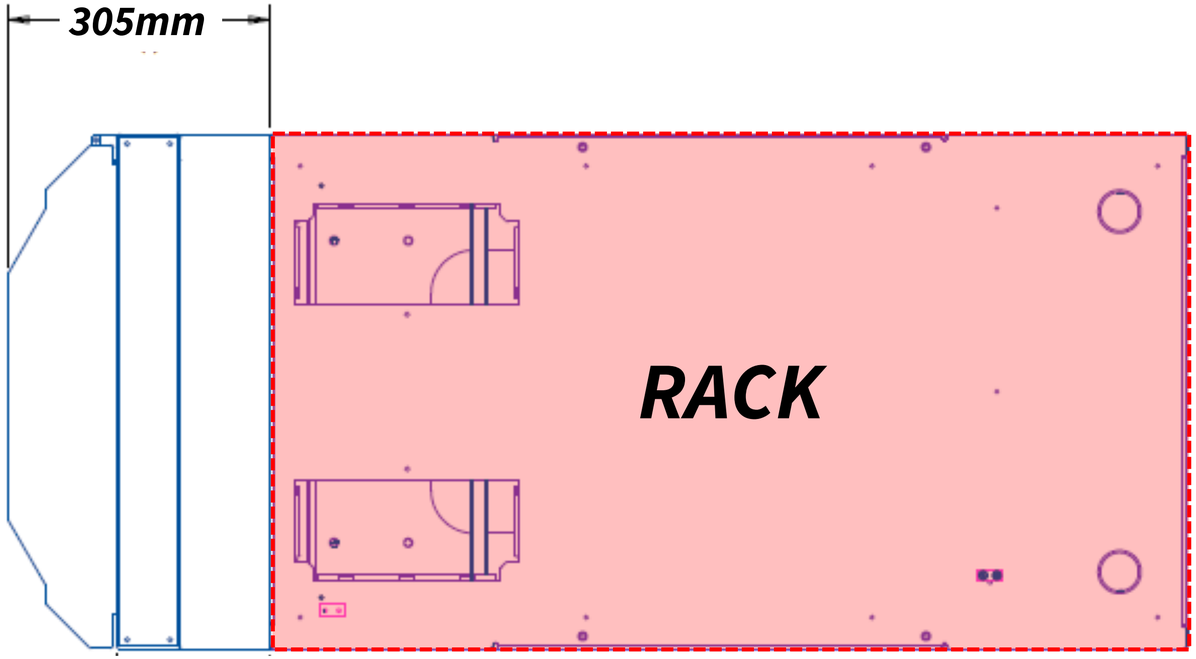
Specifications

Specification

ACS

Physical

- Width and height must be within rack’s primary structure/frame
- Maximum depth of 305mm (1ft); both active and passive versions

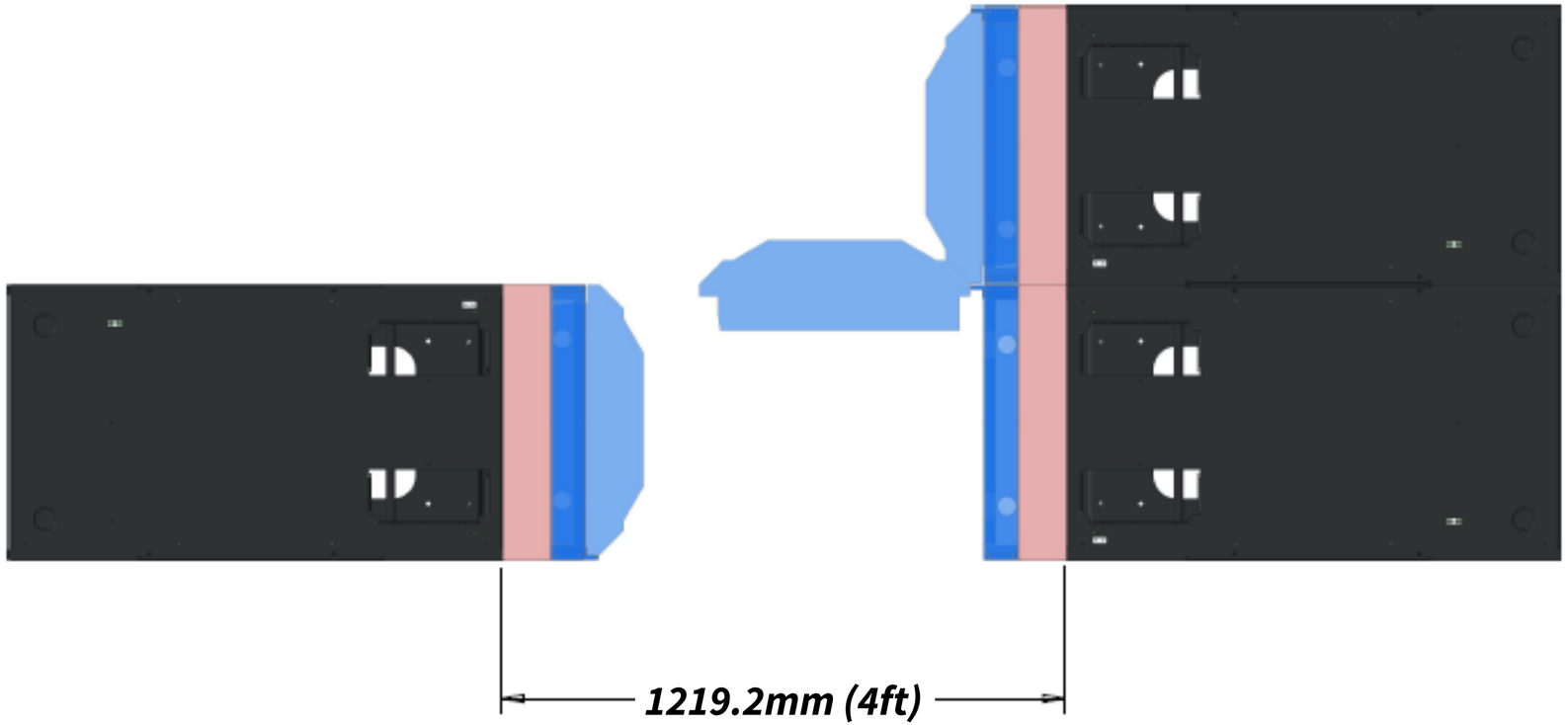


Specifications

Specification

Physical

- Hinged solution should permit opening of door by 90°



ACS

Specifications

Specification

ACS

DC Environment

- Air-side conditions

Cold-aisle Temperature	18°C ~ 35°C (65°F ~ 85°F)
Temperature Ramp Rate	5°C/15min
Cold-aisle Pressurization	0.005” H_2O (1.24Pa)
Relative Humidity	10% ~ 90%
Altitude	≤ 2000m (6600ft)
Temperature Difference *	≥ 12.2°C (22°F)

* or dependent on IT gear being supported; 12.2°C may serve as a reference value to define performance metrics under 100% neutralization of heat load

Specifications

Specification

Performance / Metrology

- For active variant, N+1 rotor redundancy is a must
- Face area of heat exchanger within supporting frame should be maximized for performance and minimal back-pressure
- Performance curves for effective sizing of solution to IT gear and rack requirements
- Low air-side pressure drop to minimize impact to server fans
- For active variant, total power consumption should be ≤ 2% of rated heat rejection capacity
- De-rating factor(s) for heat rejection capacity based on
  - Coolant selection (with respect to water)
  - Altitude (with respect to sea-level operation)

ACS

Specifications

Need for Harmonization

ACS

Some areas are common across work streams

Align with or leverage in-scope activities from cold plate

- Interfaces to facilities
- Fluid physical properties and types
- Operating conditions and parameters
- Hot-plug, dripless valves between IT gear and rack

Specifications

Planned Milestones

ACS

- Initialize specification document [2/2019]
- Input from community [On-going]
  - Physical Interfaces
  - Performance / Metrology
  - Serviceability
  - Reliability & Quality
  - Environmental & Regulations
- Formal version by OCP regional summit [9/2019]

Specifications

Call to Action

How to get involved

- Bi-weekly calls: Thursdays at 9am PST
- Next meeting on March 21st

Useful information

Project lead: Jacob Na, Facebook (jacob.na@ocproject.net)

ACS wiki : https://www.opencompute.org/wiki/Rack_%26_Power/Advanced_Cooling_Solutions

ACS mailing list: https://ocp-all.groups.io/g/OCP-ACS

ACS Door HX mailing list: https://ocp-all.groups.io/g/OCP-ACS-Door-Heat-Exchange


Open. Together.
OCP Global Summit | March 14–15, 2019
OCP
SUMMIT

Physical