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OCP-ACS Door Heat Exchanger & Similar Efforts

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Thermal Engineers, Facebook

Agenda

RACK & POWER

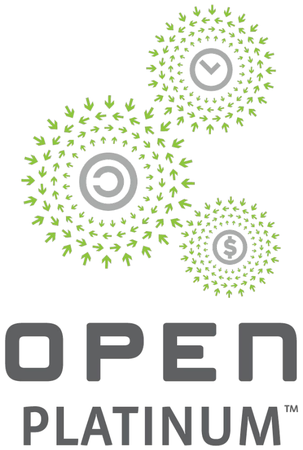
- OCP ACS Door Heat Exchanger
  - Status / specification
  - Get involved!

- Air-Assisted Liquid Cooling

- Case Study

Specifications

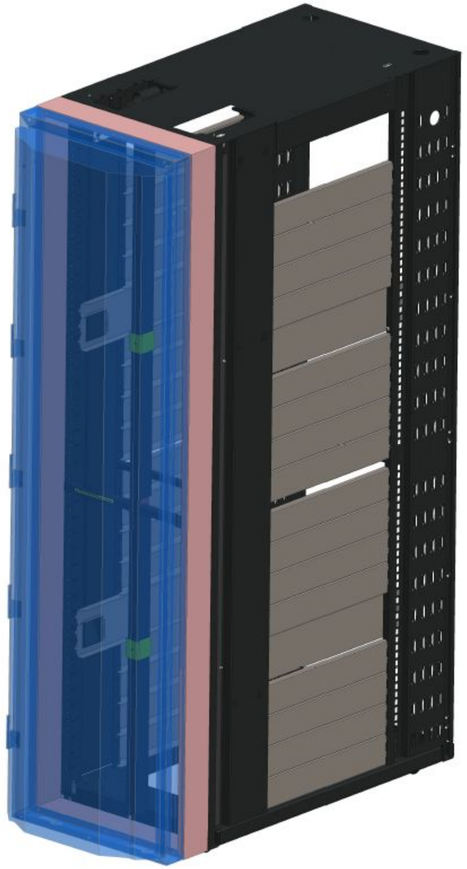
OCP-ACS Door Heat Exchanger



Door HX Work Stream

In-scope activities

- Design specific to Open Rack only
- 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

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Specifications

Overview of Solutions

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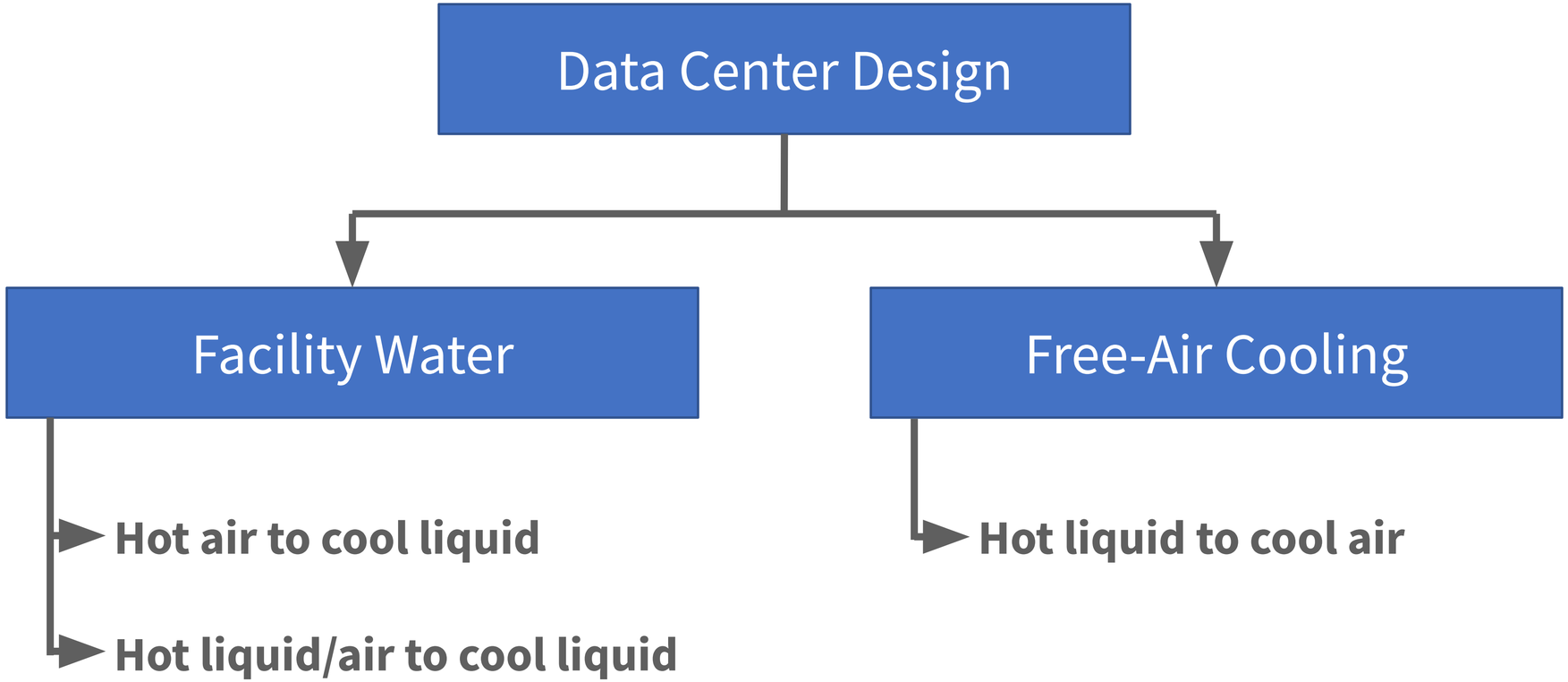
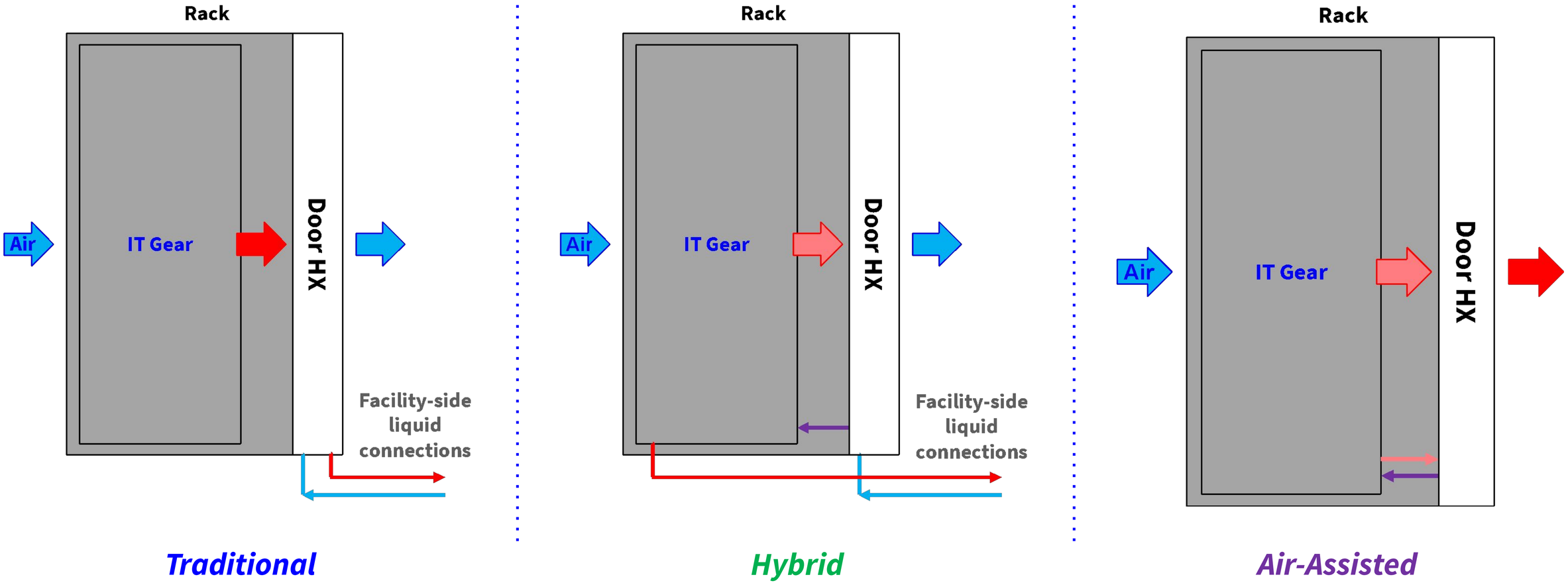


Specifications

Overview of Solutions



Specification: Traditional Solution

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Physical

DC Environment

Performance / Metrology

Monitoring & Control

Serviceability

Reliability & Quality

Environmental & Regulations

Specifications

Specification: Traditional Solution

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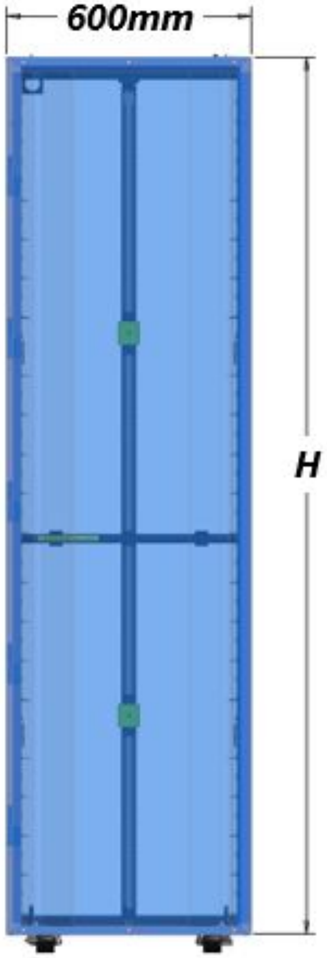
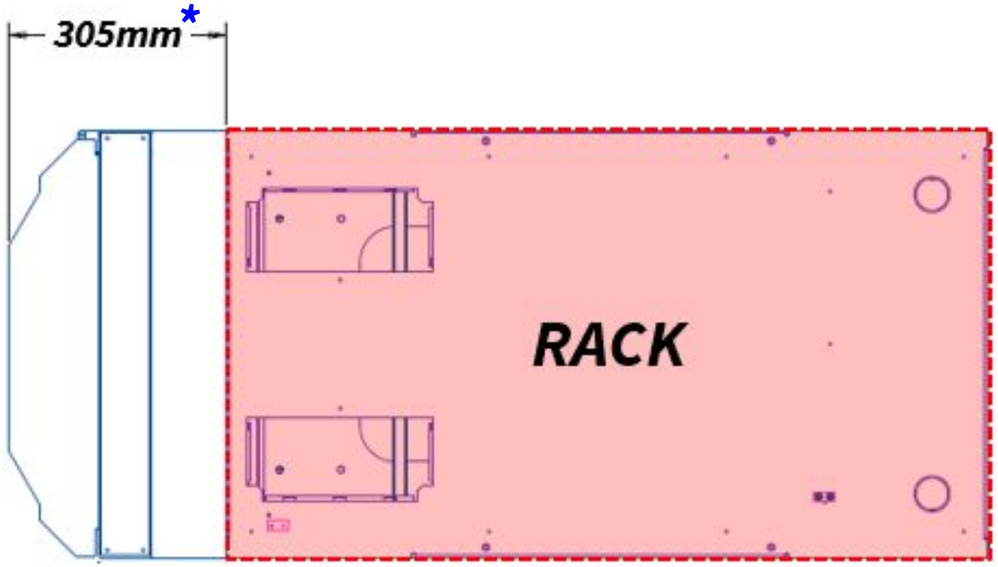
Physical



OpenRack Generation	Frame Height, H (mm)
V2	2163.7
V3	2230.0



** Maximum recommended value*

Specifications

Specification: Traditional Solution

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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
- Low air-side pressure drop to minimize impact to server fans
  - ΔP of passive cooler ≤15Pa at rated air flow
  - Total power consumption should be ≤2% of rated heat rejection capacity
- Low water-side pressure drop to minimize impact to facility
  - ΔP of complete cooling assembly ≤100kPa at rated coolant flow rate
  - Coolant supply pressure: ≤600kPa (nominal); ≤1000kPa (max. allowable)

Specifications

Specification: Traditional Solution

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Reliability & Quality

PRESSURE / LEAK TESTING

- *Checks at manufacturer (required)*
  - Complete assembly pressurized with Nitrogen to 1.5x max. allowable

Duration (minutes)	Allowable Drop in Pressure
40	≤ 3%
720	≤ 10%

- *Checks at integrator or end-user (recommended)*
- *Leak detection in operation (recommended)*

AIRFLOW SEALING

- *Sealing of adapter frame/door to rack; within rack is equally critical*

Specifications

Get Involved!

- Bi-weekly calls: Thursdays at 9am PST
  - Link to call: https://global.gotomeeting.com/join/600541373

- Working towards a formal specification for submission to IC

Useful information

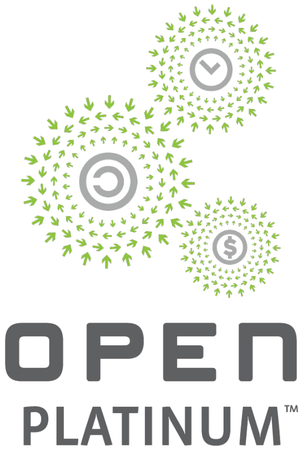
Project lead: Jacob Na, Facebook (jacob.na@ocproject.net)

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

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

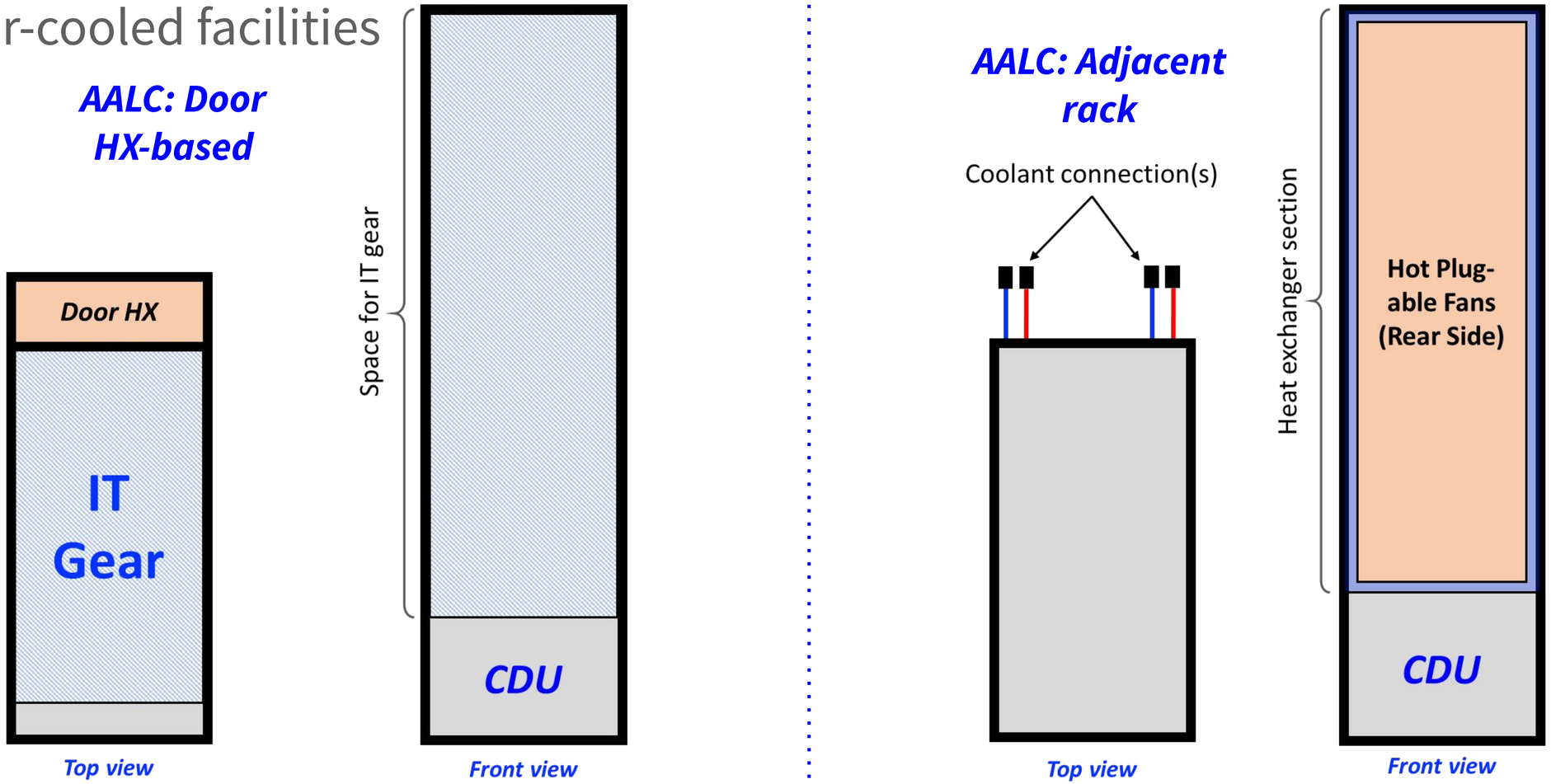
ACS Door HX mailing list: https://ocp-all.groups.io/g/OCP-ACS-Door-Heat-Exchange

Air-Assisted Liquid Cooling

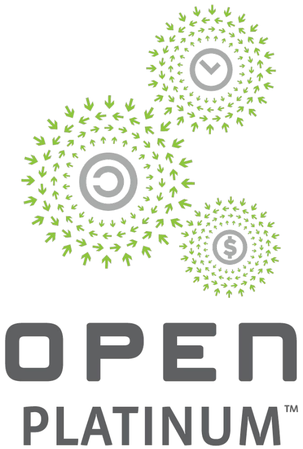


Brief Overview

- Closed-loop solutions to enable support of higher-power components in air-cooled facilities

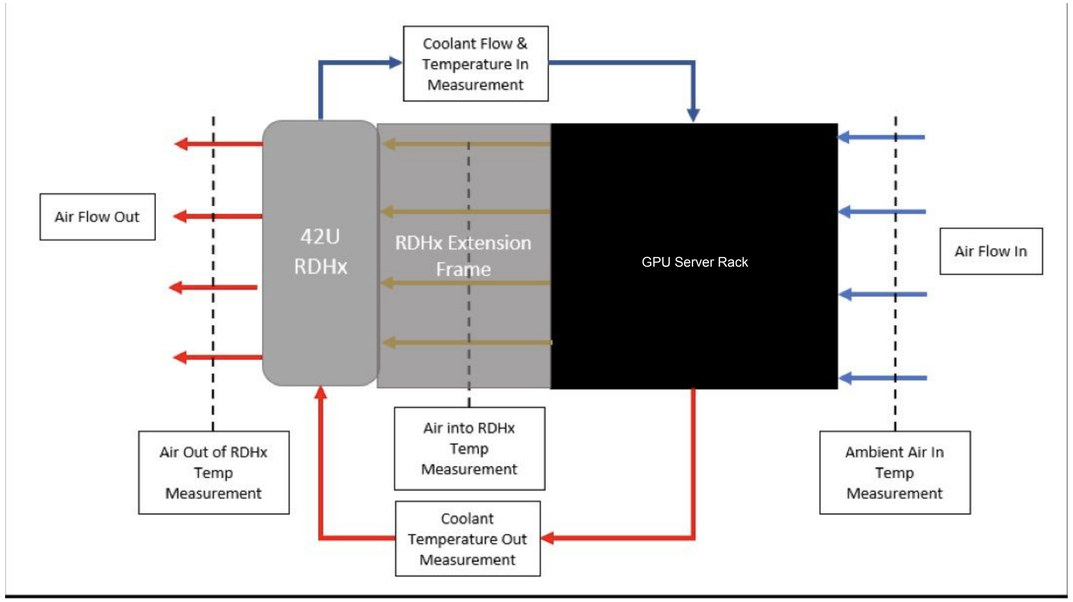


Case Study



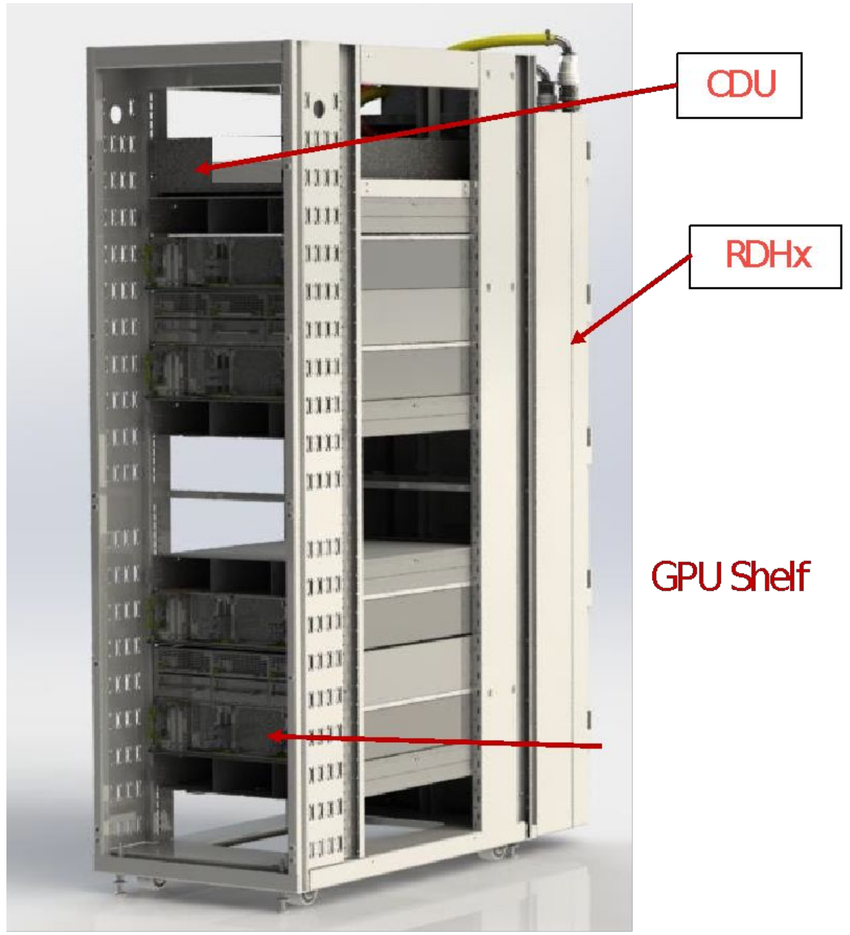
Rack Level Assembly

- Closed-loop solutions for AI/ML GPU rack

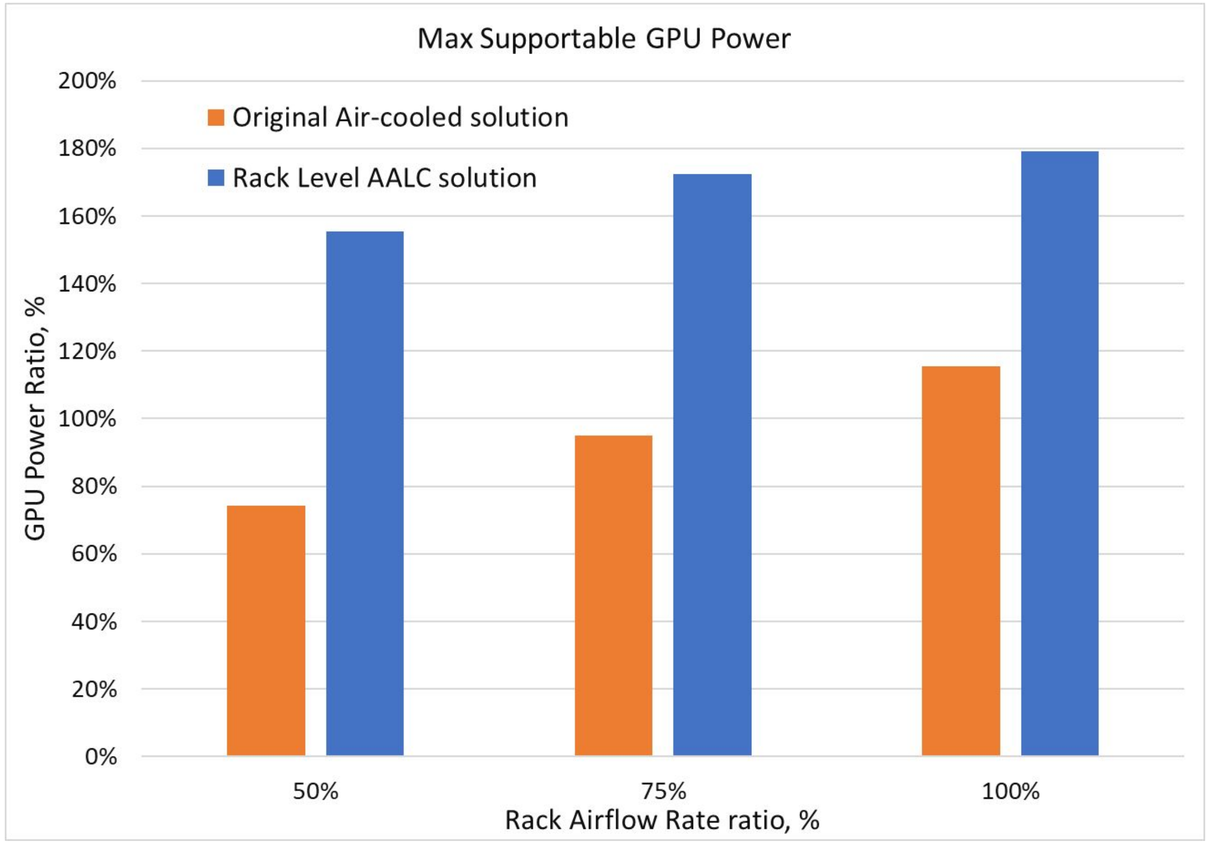


Heat flow: GPU → (Coldplate) → Coolant → (RDHx) → Air

Without facility water supply

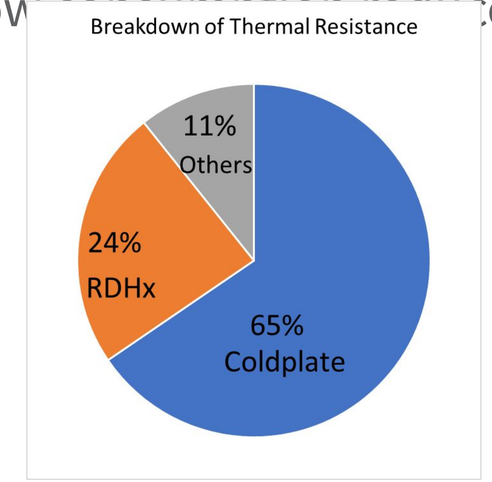


Thermal Performance



4x GPU shelves (32x GPUs) per rack

- Capable of supporting +50% power than original air-cooled solution
- Small performance reduction as airflow [illegible]ces



- Cold plate contributes majority of thermal resistance

Comments

- AALC can potentially extend air cooling limit in the absence of facility water supply
- Operational airflow and fan power consumptions can become much lower than traditional air-cooled systems
- Rack-type solution can be adjusted for different chassis population schemes
  - Fewer chips/systems → higher cooling limit

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26–27, September, 2019