

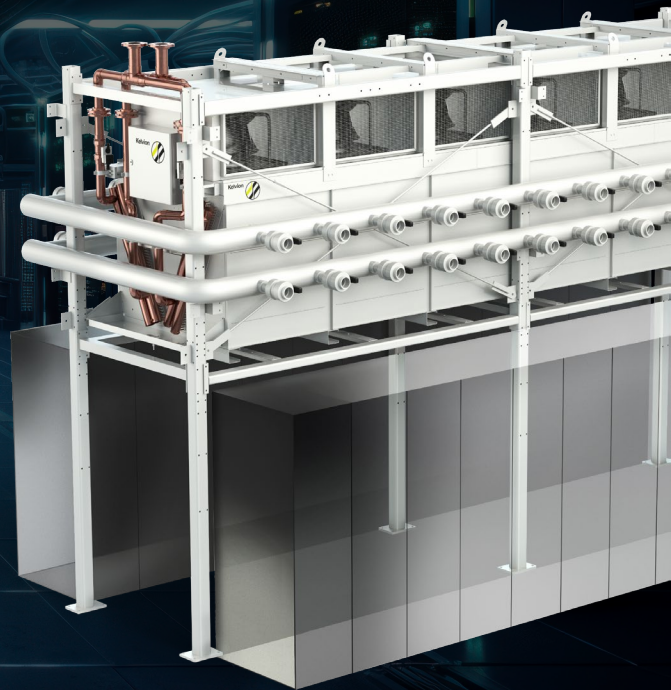


AIRACK COOLER BRINGING COOLING CLOSER TO THE IT LOAD

As AI, HPC and high-density computing reshape the data center landscape, cooling needs to evolve with them.

AIRack brings cooling closer to the IT load, reducing airflow distances and enabling more targeted thermal management within the white space.

This paper explores how the concept supports efficient, scalable and reliable cooling for increasingly demanding data center environments.



DATA CENTER COOLING IS CHANGING

AI, high-performance computing and increasingly dense IT environments are changing the requirements for data center cooling.

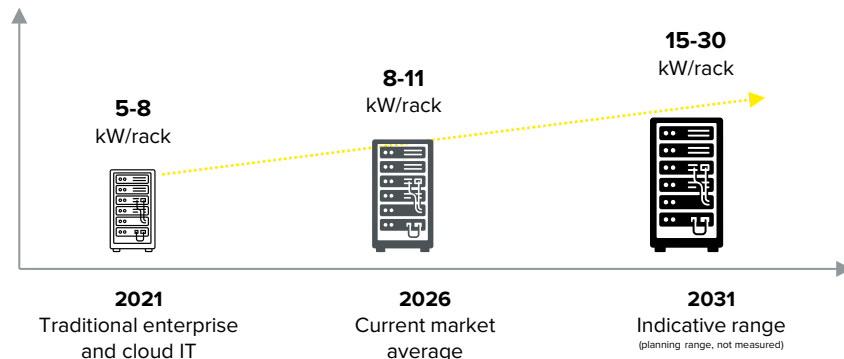
As more computing power is concentrated into the white space, traditional room-level cooling concepts can face growing challenges in delivering air precisely where it is needed.

The issue is not cooling capacity alone. Long airflow paths, mixing between hot and cold air, bypass airflow and changing IT loads can all reduce the effectiveness of a cooling system.

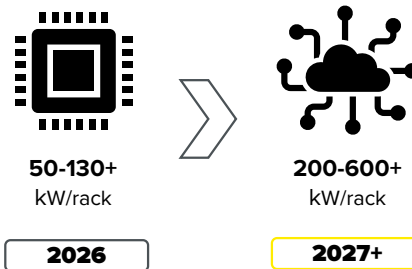
In high-density environments, **how cooling is delivered becomes just as important as how much cooling capacity is installed.**

The AI Rack cooler addresses this challenge by moving cooling closer to the heat source. Instead of relying on large room circulation patterns, the system is positioned directly in the hot aisle environment, shortening airflow paths and helping to create a more controlled and efficient cooling architecture.

DATA CENTER COOLING IS CHANGING



THE AI IMPACT: HIGHER DENSITIES, NEW DIMENSIONS



AI workloads are driving a new class of infrastructure with significantly higher power densities and cooling requirements.

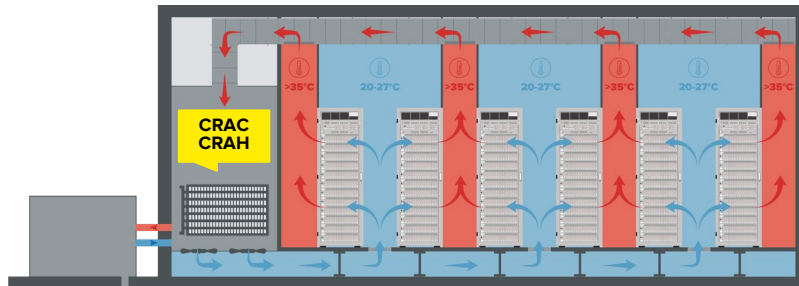


FROM ROOM COOLING TO TARGETED HEAT REMOVAL

Conventional CRAC and CRAH concepts typically cool the white space at room level. Air may travel through raised floors, ceiling plenums or across comparatively long distances before reaching the IT equipment.

Every additional part of this airflow path creates opportunities for hot and cold air to mix. Even a correctly sized cooling system can therefore struggle to maintain the required IT conditions when airflow is not properly managed.

AIRack changes this approach. Installed close to the racks, it removes heat directly from the hot air stream and transfers it into the facility cooling system. This reduces the distance air needs to travel and helps limit recirculation and mixing losses. The result is a cooling concept designed around the actual heat load rather than around the room.



Traditional Hot Aisle Containment | CRAH Setup

DESIGNED FOR HIGH-DENSITY WHITE SPACE

AIRack combines the flexibility of air cooling with localized heat removal close to the heat source. This makes it particularly relevant for data centers where rising rack densities are pushing conventional room-level airflow concepts closer to their limits.

Its main benefits include:

- **Shorter airflow paths** that help reduce mixing and recirculation.
- **Efficient use of white space**, keeping valuable floor area available for IT infrastructure.
- **Modular scalability** that supports evolving data center requirements.
- **Compatibility with high-density environments**, including facilities transitioning towards hybrid air and liquid cooling architectures.
- **Integrated control of airflow and cooling capacity** to respond to changing IT loads.

Rather than replacing every other cooling technology, AIRack complements the wider cooling architecture.

It can operate alongside facility water systems, heat rejection equipment, CDUs and liquid cooling solutions as part of an integrated thermal management strategy.

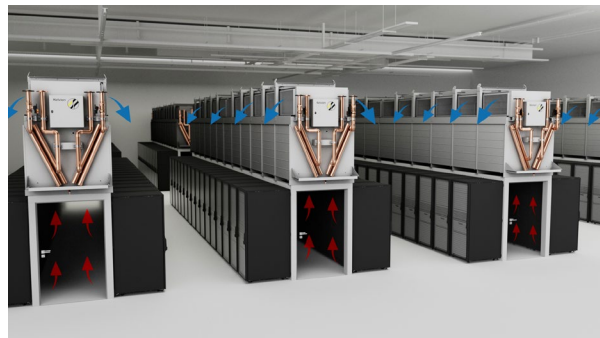
EFFICIENCY STARTS WITH AIRFLOW

Cooling performance depends on more than the heat exchanger itself. AIRack is designed as part of an airflow management concept in which rack arrangement, containment, installation quality and controls all work together.

A key requirement is maintaining the right balance between the airflow generated by the IT equipment and the airflow delivered by the cooling system. Too little airflow can lead to hot air recirculation and local hot spots. Too much airflow can create bypass and unnecessary fan energy consumption.

For this reason, good containment is essential. Leakage paths, poorly sealed openings or insufficient clearances can allow hot and cold air to mix before the heat reaches the cooling coil, reducing overall effectiveness.

In an AIRack installation, containment is not simply part of the room construction. It is part of the cooling system itself.



 Hot Air

 Cold Air

BUILT FOR CHANGING IT LOADS

Modern data centers rarely operate at one fixed design condition. AI and HPC workloads can create rapid changes in heat load, making stable control increasingly important.

AIRack manages airflow and cooling capacity as separate but coordinated processes. This enables the system to adapt as operating conditions change rather than continuously running at maximum output.

The objective is not to provide as much cooling as possible. It is to provide the right cooling at the right time, helping balance thermal performance, energy use and operational stability.

Nominal heat duty:	max. 250 - 450 kW
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Maximum Heat Duty:	500+ kW
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Design Approach:	2 – 5 K
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Media temperature – inlet (EWT):	20 – 24 °C
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Media temperature – outlet (LWT):	35 – 40 °C
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ENGINEERING THE COMPLETE SYSTEM

Successful high-density cooling requires a system-level perspective. AIRack performance is influenced by the facility cooling loop, IT layout, containment, controls integration and operating conditions.

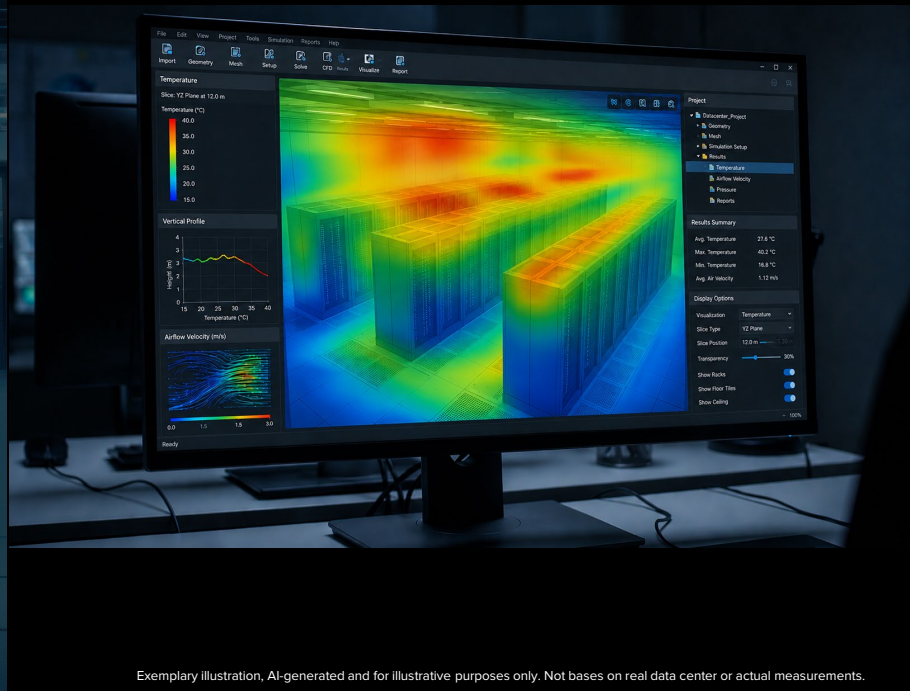
Engineering tools such as Computational Fluid Dynamics can help identify airflow tendencies, potential recirculation zones and opportunities to optimize the layout before installation. But simulations are only one part of the process. Changes in rack populations, containment, cabling or operating conditions can alter airflow after commissioning.

For this reason, effective cooling design combines simulation, engineering experience, careful commissioning and disciplined operation throughout the data center lifecycle.

COOLING CLOSER. OPERATING SMARTER.

As compute densities increase, the traditional approach of cooling the room first and the IT equipment second becomes increasingly difficult to optimize.

AIRack brings heat transfer closer to the source, creating shorter airflow paths and more direct control over the thermal environment. When combined with effective containment, intelligent controls and a well-designed facility cooling infrastructure, it provides data center operators with a scalable approach to managing increasingly demanding white space environments.



AIRack turns cooling from a room-level function into a targeted part of the data center infrastructure – helping operators prepare their white space for the next generation of computing.

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