

DATA CENTER COOLING: CLOSE-COUPLED VS. CLOSED LOOP

Two data center terms describing high density cooling configurations can confuse even people who are “in the know”: close-coupled and closed loop. This tipsheet explains both and outlines key benefits of each.

The first thing to understand: **CLOSE-COUPLED** refers generally to the location of a cooling solution – **CLOSE** to the equipment it’s cooling. **CLOSED LOOP** is a form of close-coupled cooling, in which the cooling loop acts as its own microclimate within a single IT cabinet or multiple cabinets in a row (*there are also open loop systems; read more about those below*).

WHAT IS CLOSE-COUPLED COOLING?

Because close-coupled methods bring the heat removal as close to the source of heat as is practical, airflows are minimized and the result is improved efficiency – especially when compared to traditional room cooling methods.

BENEFITS »

- **Efficiency:** Reduce, or even eliminate, reliance on CRACs, fans and raised floor tiles; eliminates hot spots associated with high-density racks
- **Saves space:** Reduces need to build larger spaces/reduces footprint
- **Scalable:** Add enclosures and cooling without adding to infrastructure

CONFIGURATIONS



Close-coupled cooling can be configured as either a **CLOSED LOOP** or **OPEN LOOP** system.

CLOSED LOOP

- Closed loop cooling operates independent of the room in which it’s installed
- The rack and heat exchanger work exclusively with one another and do not rely on or affect the surrounding environment

CLOSED LOOP CONFIGURATION

IN-RACK COOLING:

Airflow is contained within the cabinet/enclosure, with cold air brought to the server inlet and heated air directed to the cooling coil. Because the cooling is focused, users can install very dense equipment regardless of the room’s temperature/humidity.

OPEN LOOP

- Instead of fully contained cabinets or rows, open loop systems work with traditional rack mount server cabinets, needing the fully perforated doors to circulate air through the cabinets and installed IT appliances
- Open loop configurations may need to rely on the environment of the room in which the units are located. Air flow to and from the unit is affected by (and affects) the temperature and humidity in the room
- Heat removal is accomplished by running chilled water or refrigerant through cooling coils and rejecting heat via a remote mechanical chiller system

OPEN LOOP CONFIGURATIONS

IN-ROW AIR CONDITIONING:

The in-row (sometimes called in-line) cooling method brings the room’s climate control and heat removal to data center rows while still maintaining a cold aisle/hot aisle row orientation.

- May serve as supplemental cooling in existing data centers
- May be used to address higher density installations within the data center
- May be used with cold aisle/hot aisle containment to achieve even greater efficiency

REAR DOOR HEAT EXCHANGERS (RDHX):

Heat exchangers replace the rear door of an enclosure that utilizes front-to-back airflow to cool equipment. Warm air passes through the heat exchanger coil and is returned to the room at the appropriate temperature.

- Eliminates individual data center hot spots
- Allows users to utilize spaces not originally designed as data centers
- Redundancy can be affected – loss of a RDHX unit will eliminate all heat removal capacity for the affected footprint with potential negative impact on overall IT space capacities
- Do not take up valuable floor space



When selecting the right cooling method for your data center or Edge deployment, turn to the experts. Rittal will work with you to identify the most efficient solution for your needs today, and well into the future.