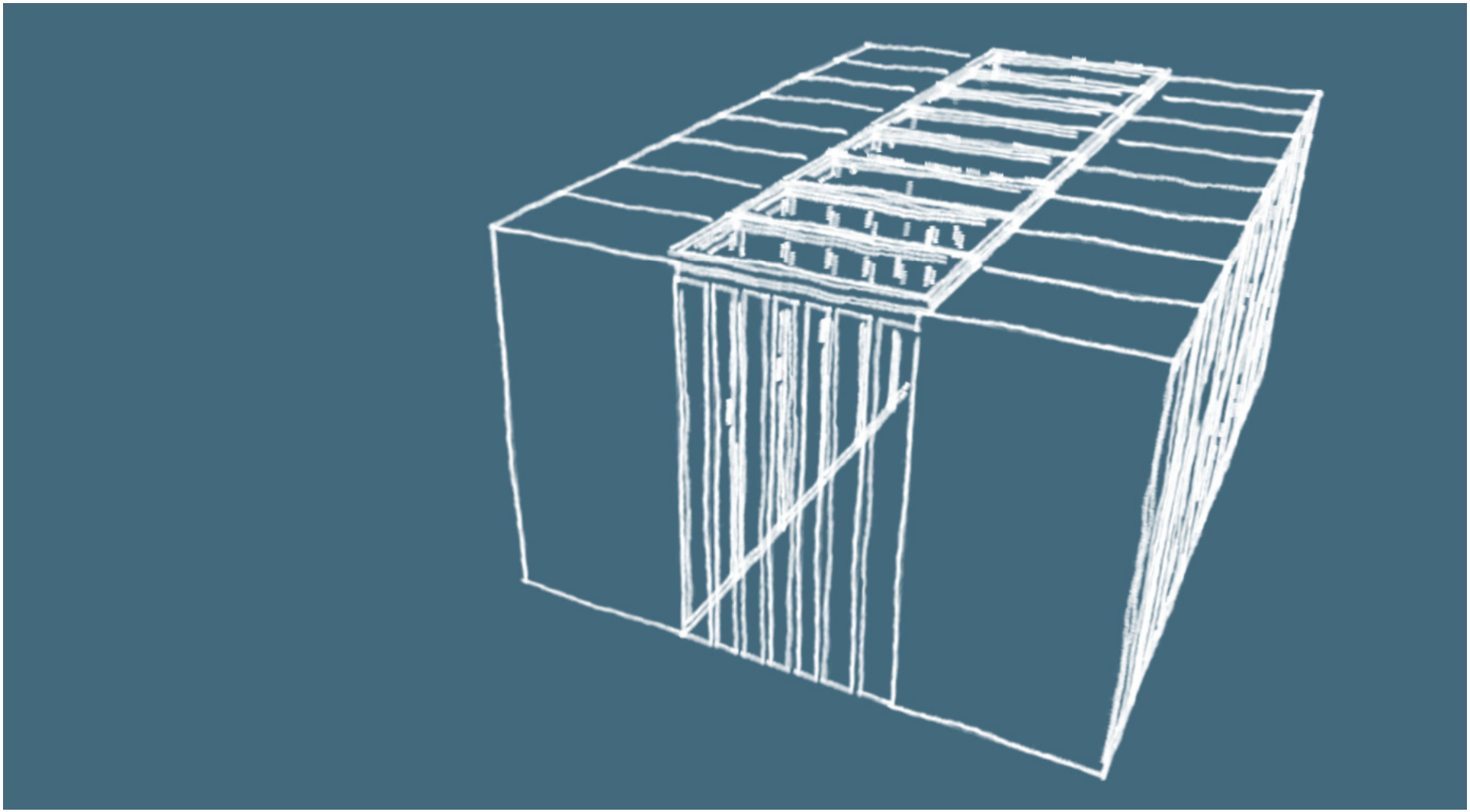
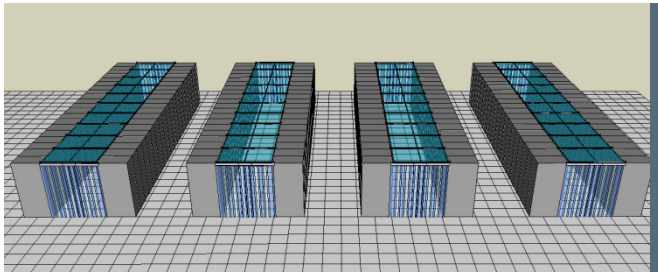
Smart Containment

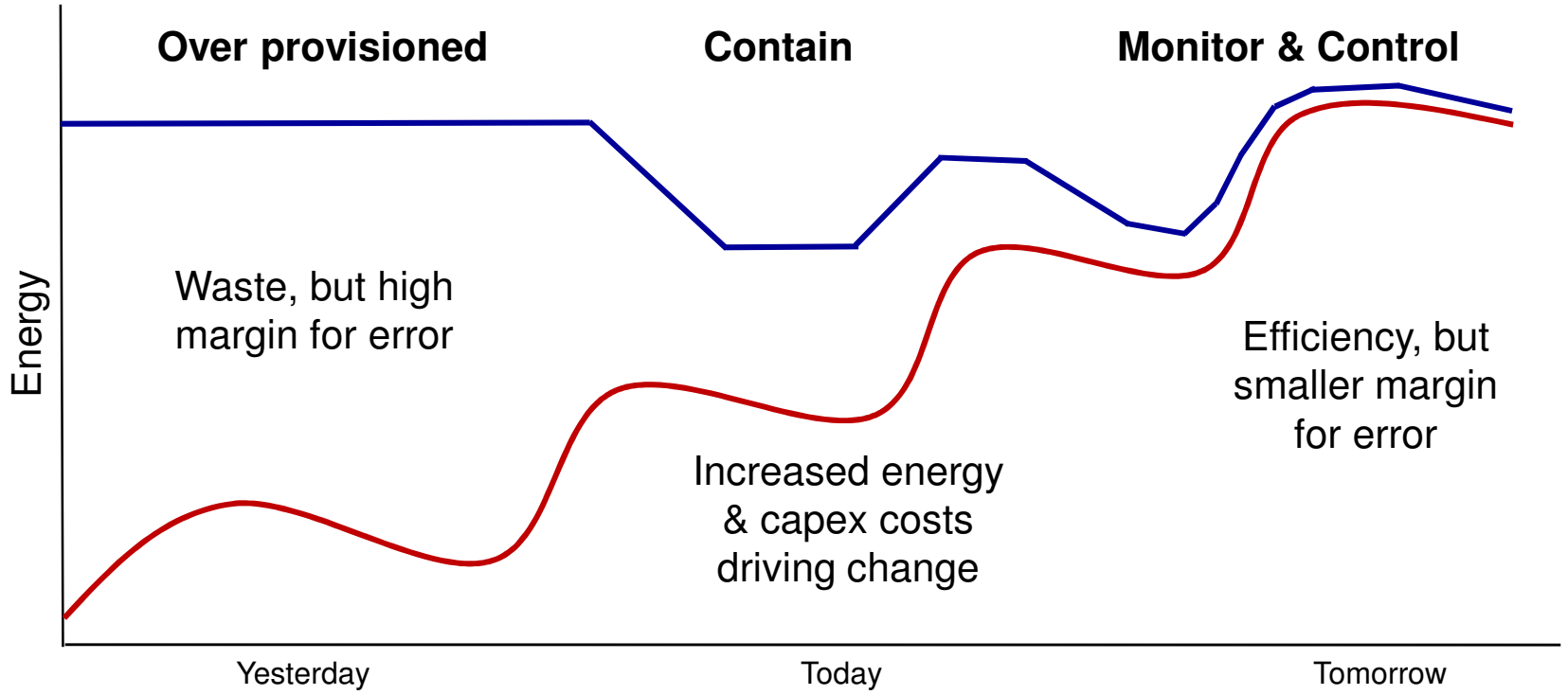
Extending the Life of the Data Center

POLARGY

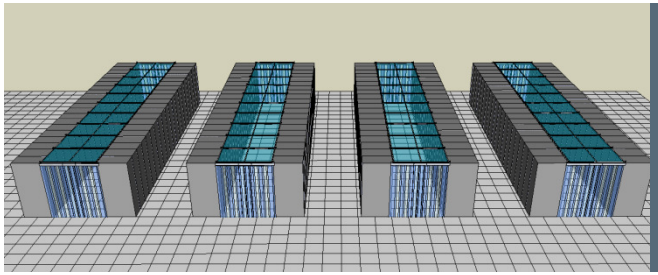




The Cooling Trend

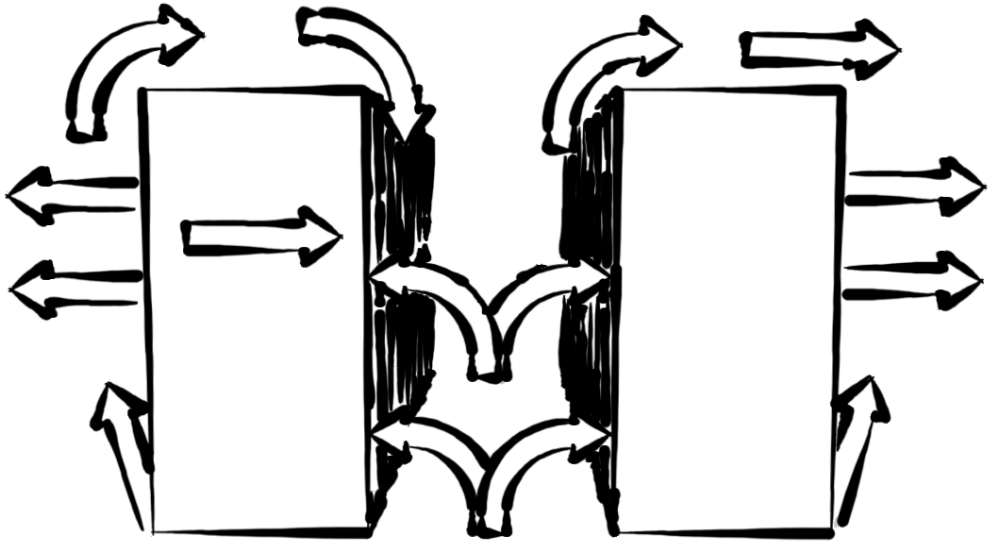


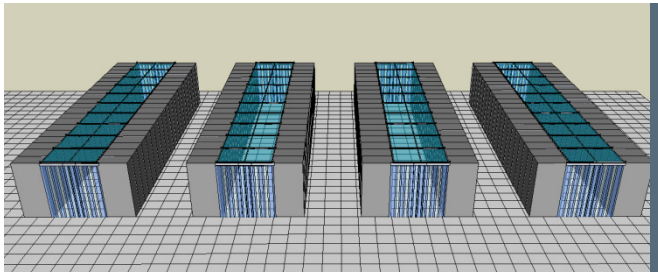
→ Need new tools to closely couple cooling to demand



Air Mixing Lowers Efficiency

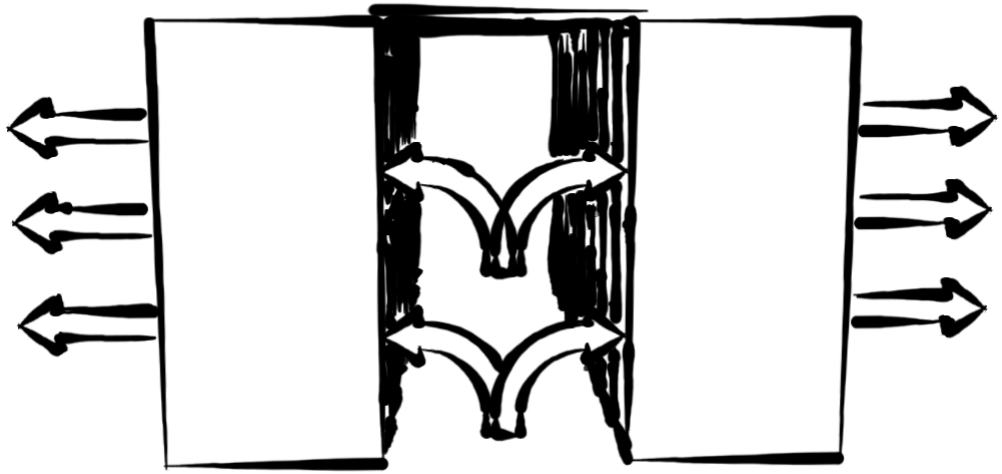
- Low ∆-T impairs CRAH efficiency
- Capacity unnecessarily limited
- 60% of cold air is wasted
- Typical 3X over provisioned
- Free mixing prevents tight supply control

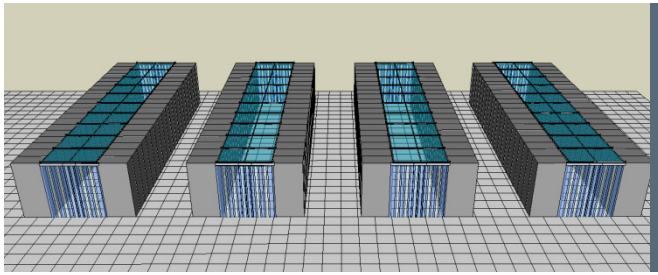




Containment Stops Mixing

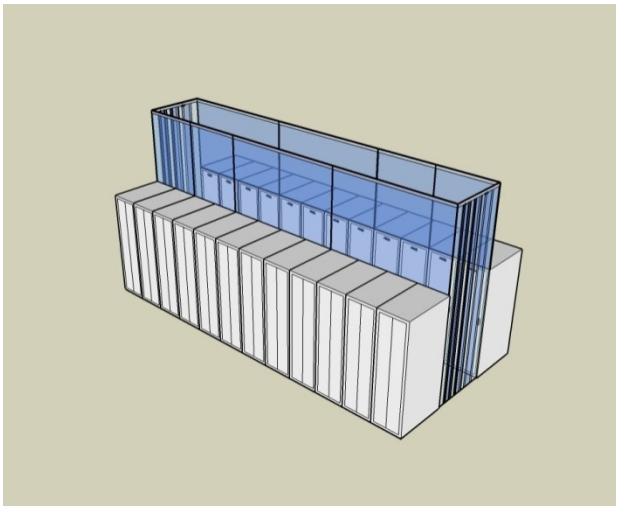
- High ∆-T boosts CRAH efficiency
- Reduces operating expenses
- Capacity expands
- Eliminates hotspots
- Isolated airflow enables tight supply control

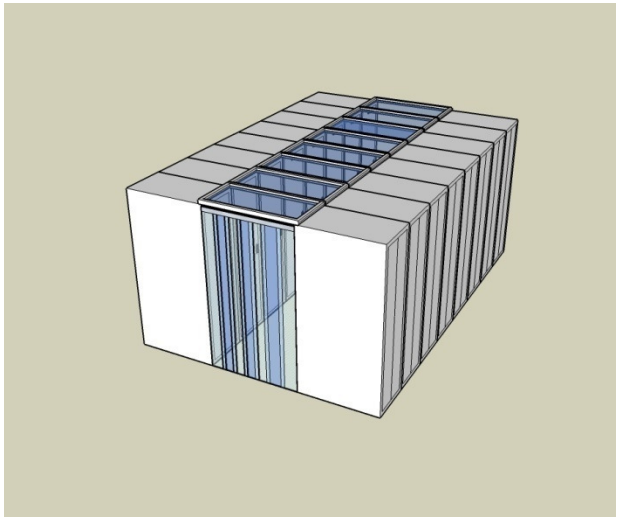


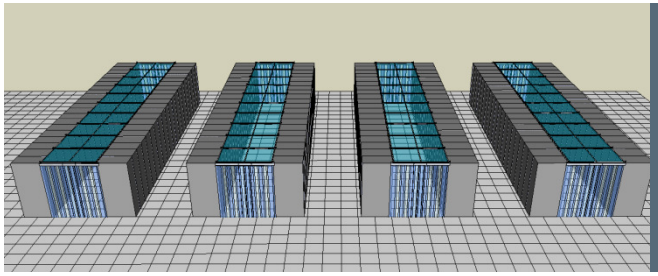


How Does Containment Work?

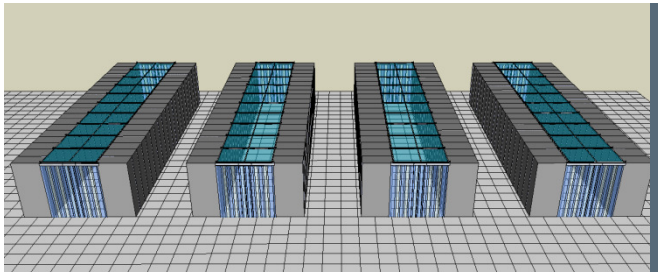
- Airflow isolation barriers prevent hot return air from mixing with cold supply air
- The hot return air stays hot, increasing the return air temperature to the CRAH units
- The ∆-T across the CRAH increases which results in more efficient cooling
- Makes the supply air temperature more uniform across the server inlets, improving reliability







Containment Systems



The Great Debate – Which Aisle Do You Contain?

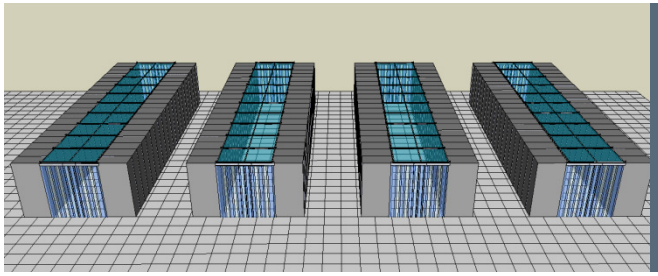
Hot Aisle

- Keeps ∆-T highest by preventing cooling of the hot air
- Comfort in open area
- Switch gear
- Easy to balance zones

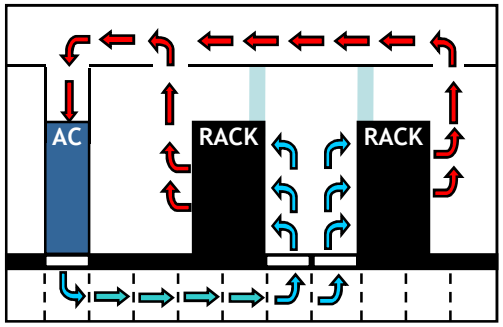
VS.

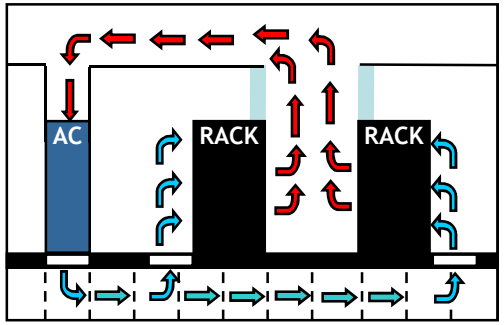
Cold Aisle

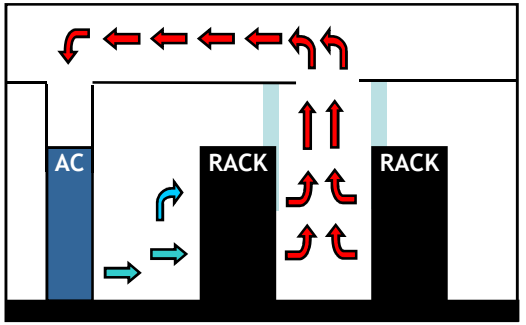
- More direct path of cold air to servers
- Positive air pressure
- Comfort in hot aisle
- More deployment options

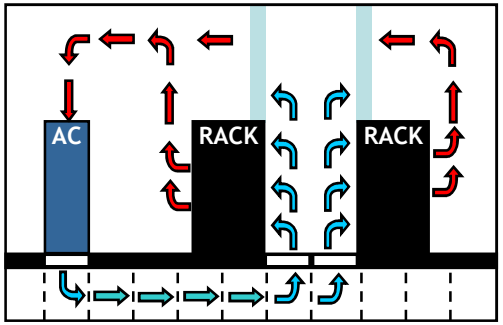


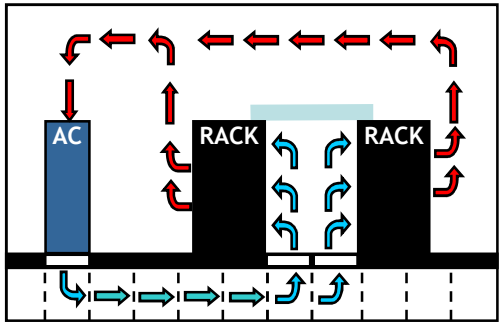
Containment Architectures

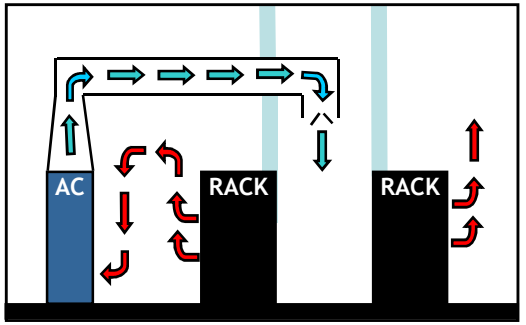


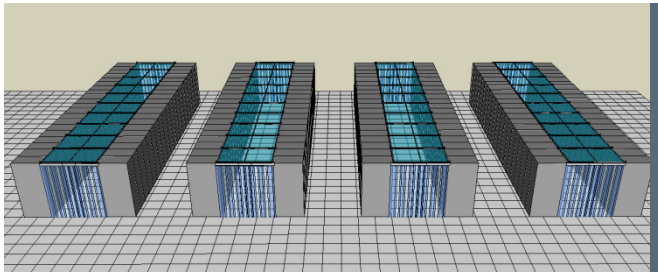






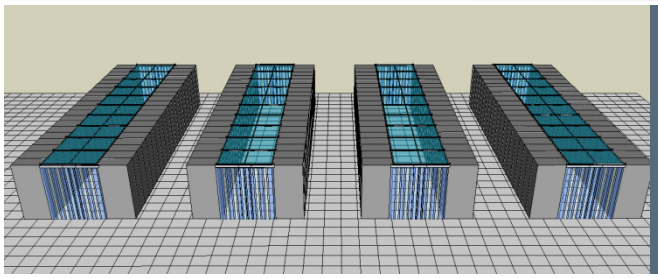






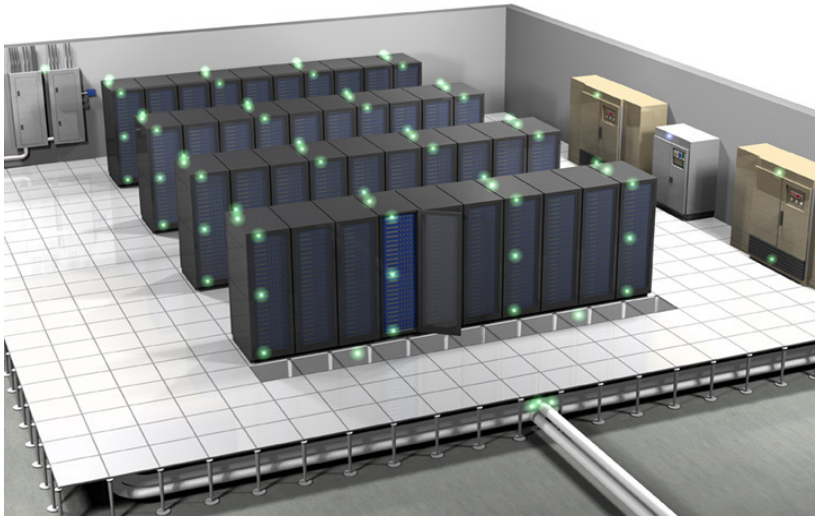
Smart Containment: The Cooling Efficiency Stack

MONITOR	CONTAIN	CONTROL
• Temperature • Pressure • Humidity • Power • Cooling plant	• Barriers above racks • Doors on aisle ends • Blanking panels • Filling floor gaps • Plenum returns with ducted CRAHs	• Fan speed • Set points • Chilled water flow • Economizer hours • CRAH on/off



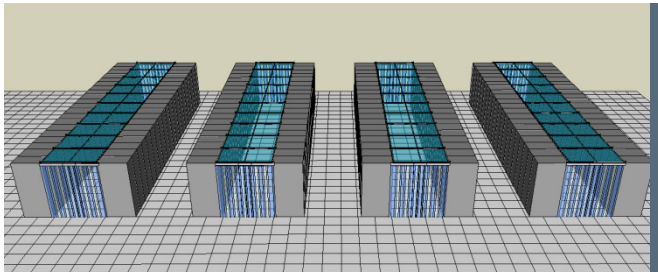
Monitor & Control

Wireless Sensor Network



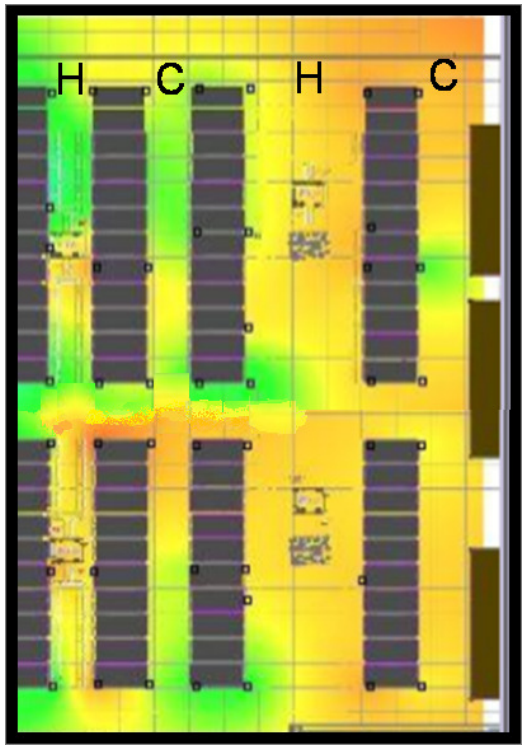
Adaptive Control Measures

- Automatic start/stop of CRAC units
- Adjust variable speed fans
- Change CRAC set points
- Increase chilled water set points
- Manage the usage of air side economizers



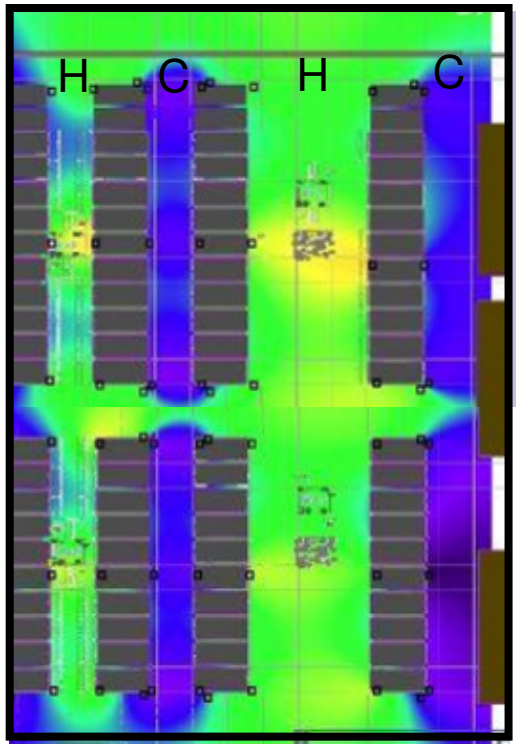
Two Sets of Gains:
1) Containment and 2) Control

Baseline



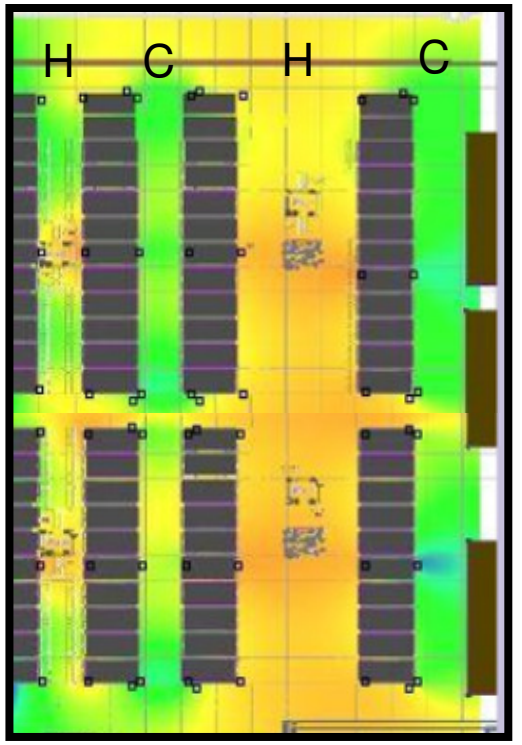
- No containment
- High degree of air mixing
- High inlet temperatures

After Containment

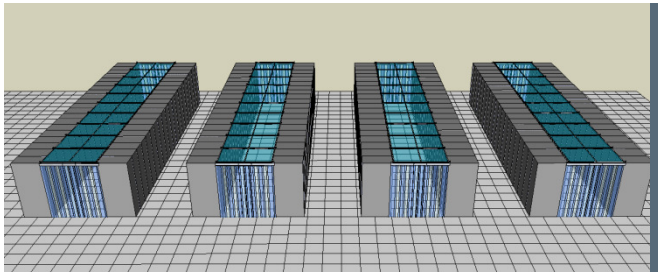


- Cold aisle contained
- Higher Δ-T
- No change to CRAHs

With Control



- Controlled CRAHs
- ASHRAE inlet temperatures
- Increased return temperatures



Published Case Studies

LBNL

Fan speed reduction of 75%

12% reduction in cooling energy

Altera

Server inlet variance reduced from 14^0F to 2^0F

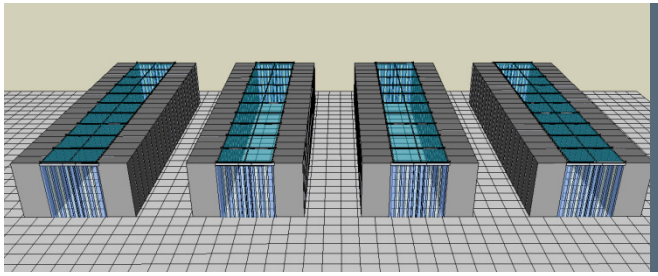
12.5% energy reduction

Yahoo

Supply air temperature increased 21^0F

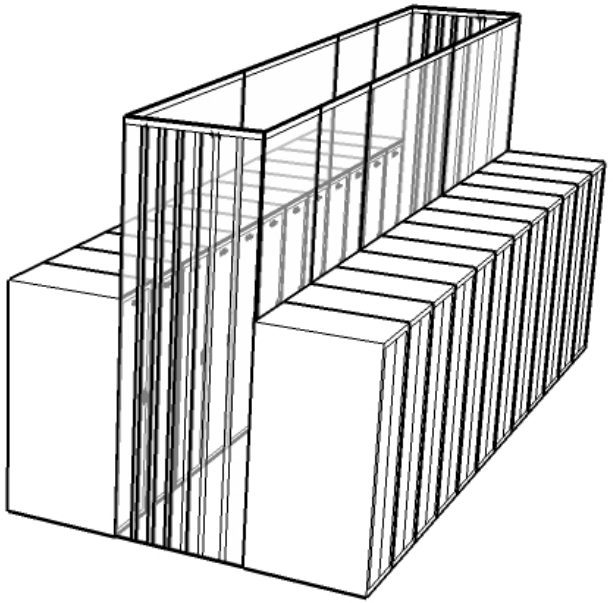
21% reduction in cooling energy

Published by Accenture/Silicon Valley Leadership Group
These are not Polargy projects



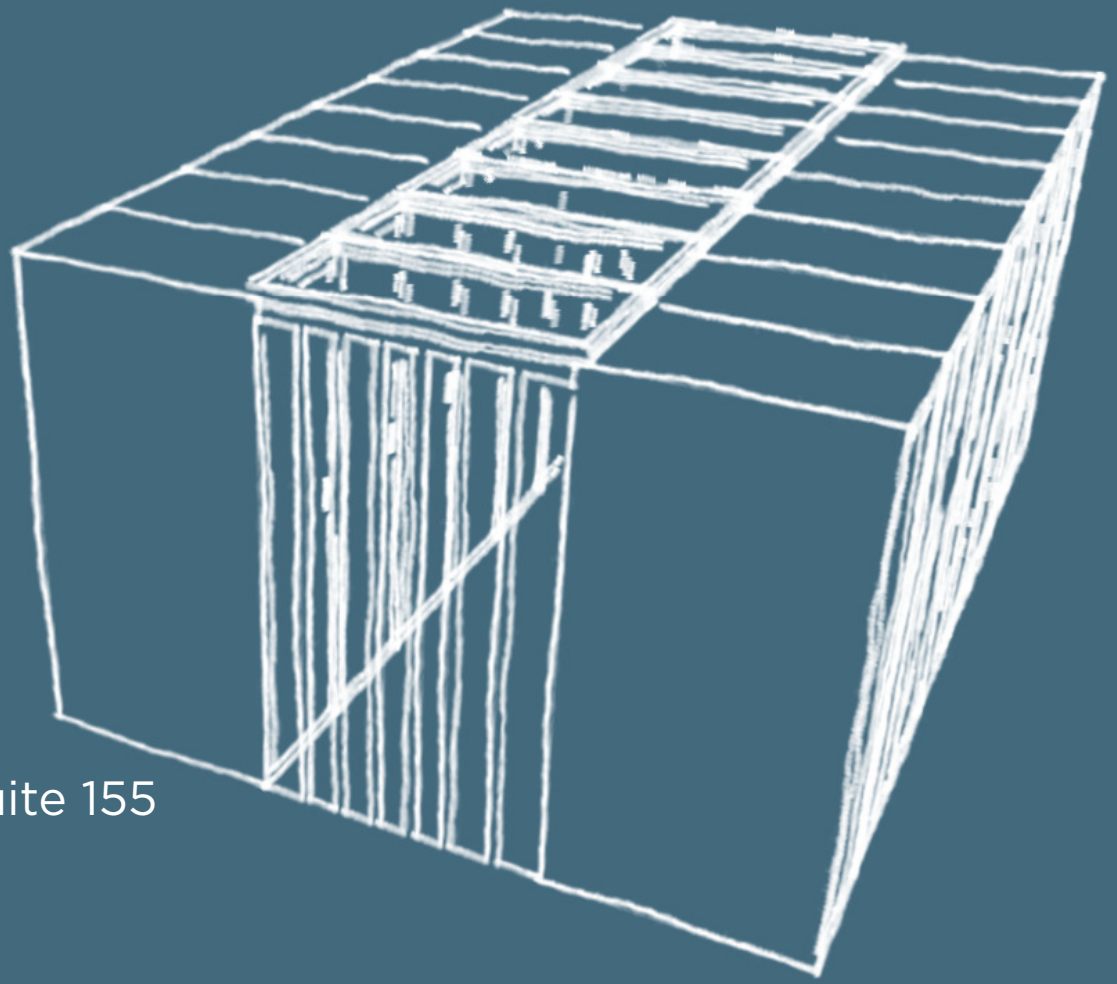
Compelling ROI

- **Energy savings from reduced fan speeds and lower demand on chilled water plant**
- **Reduced heat related failures**
- **Power utility rebates**
- **More capacity out of the data center**



POLARGY

WWW.POLARGY.COM



Polargy, Inc.
256 Gibraltar Drive, Suite 155
Sunnyvale, CA 94089
888.816.8338