EUROVENT MIDDLE EAST

HVACR Leadership Workshops

Evaporative Cooling Solutions for Data Centres

Mr Tom Bosmans

Application Manager

Baltimore Aircoil International NV.

EUROVENT MIDDLE EAST

HVACR Leadership Workshops

Agenda

- Global Trends
- Global Support
- Types and solutions
- Data Centre Trends
- Free Cooling
- Key Takeaways

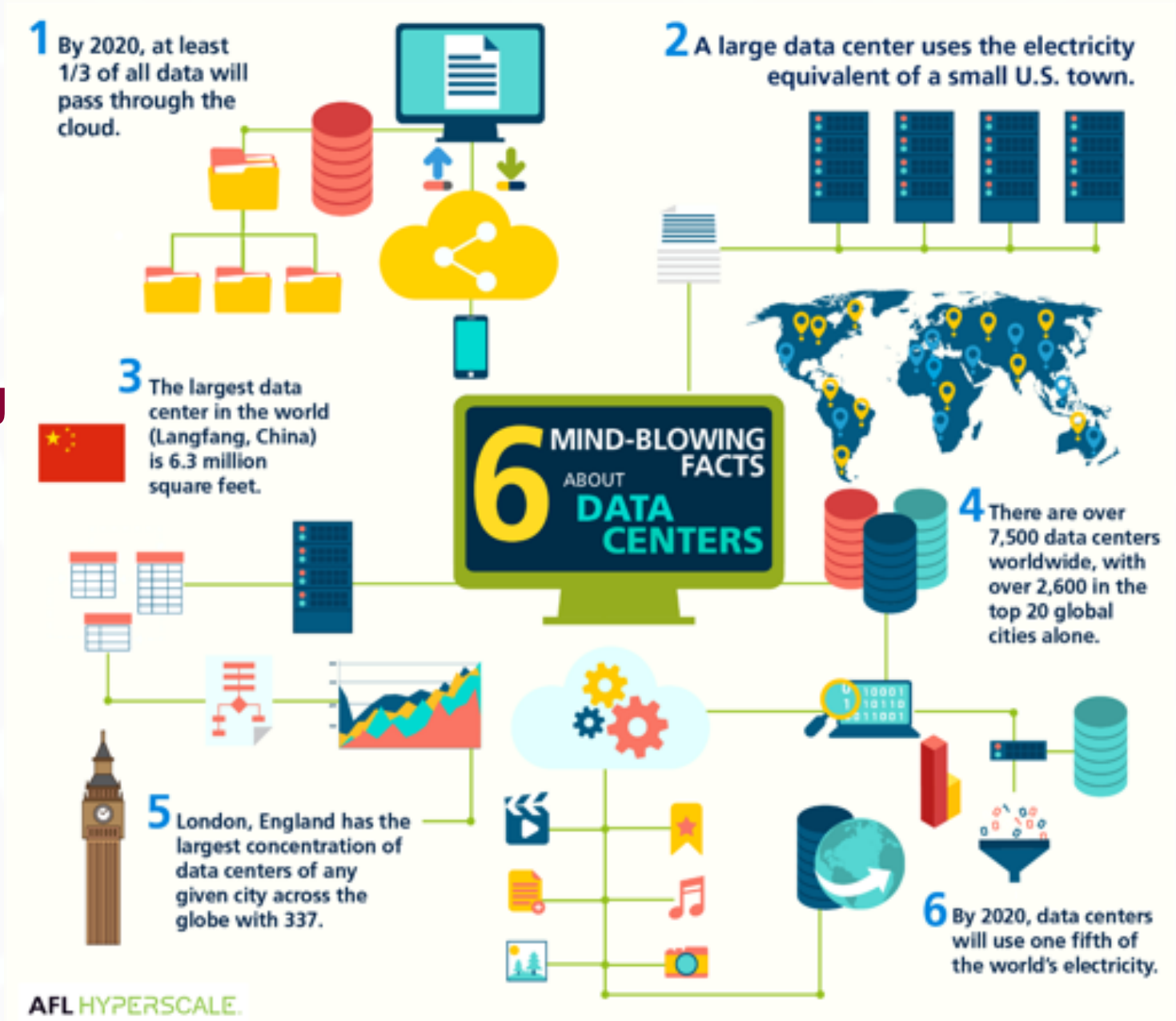
Global Trends

Growth Drivers – Operations – Customer needs

EUROVENT MIDDLE EAST

HVACR Leadership Workshops

Customers are looking for a global partners with reliable, energy savings solutions.



Global Trends
Growth Drivers

Customer Needs

IOT – Edge Computing
More connected devices
Faster processing speed
Smart Cities

Flexible Footprint | High Heat Transfer | High Reliability | Plug + Play

Growth of large cloud-based data centres

- 4 Billion people connected to the internet
- Need for storage and processing growing exponentially.
- Data centres are growing to the size of small cities

365 Year Round Reliability | High Heat Transfer | Redundancy | Reduced Energy Usage

Global Trends
Operations

Customer Needs

Continuous Operation:

Data centres operate continuously at constant loads.

365 Year Round Reliability

Redundancy

Reduced Energy Usage

Power Usage Effectiveness (PUE):

Focus on energy efficiency and sustainability.

Reduced Energy Usage

Water:

Maintain operation if water supply is interrupted.

Redundancy

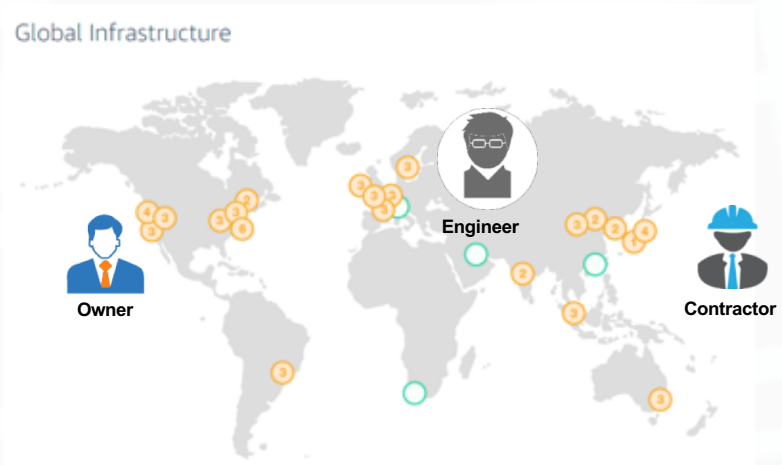
Reduced Water Usage

Global Trends
Owner, Engineering, Contractors

Customer Needs

- Large data centres, single owner
- Constructing globally

Global design and construction

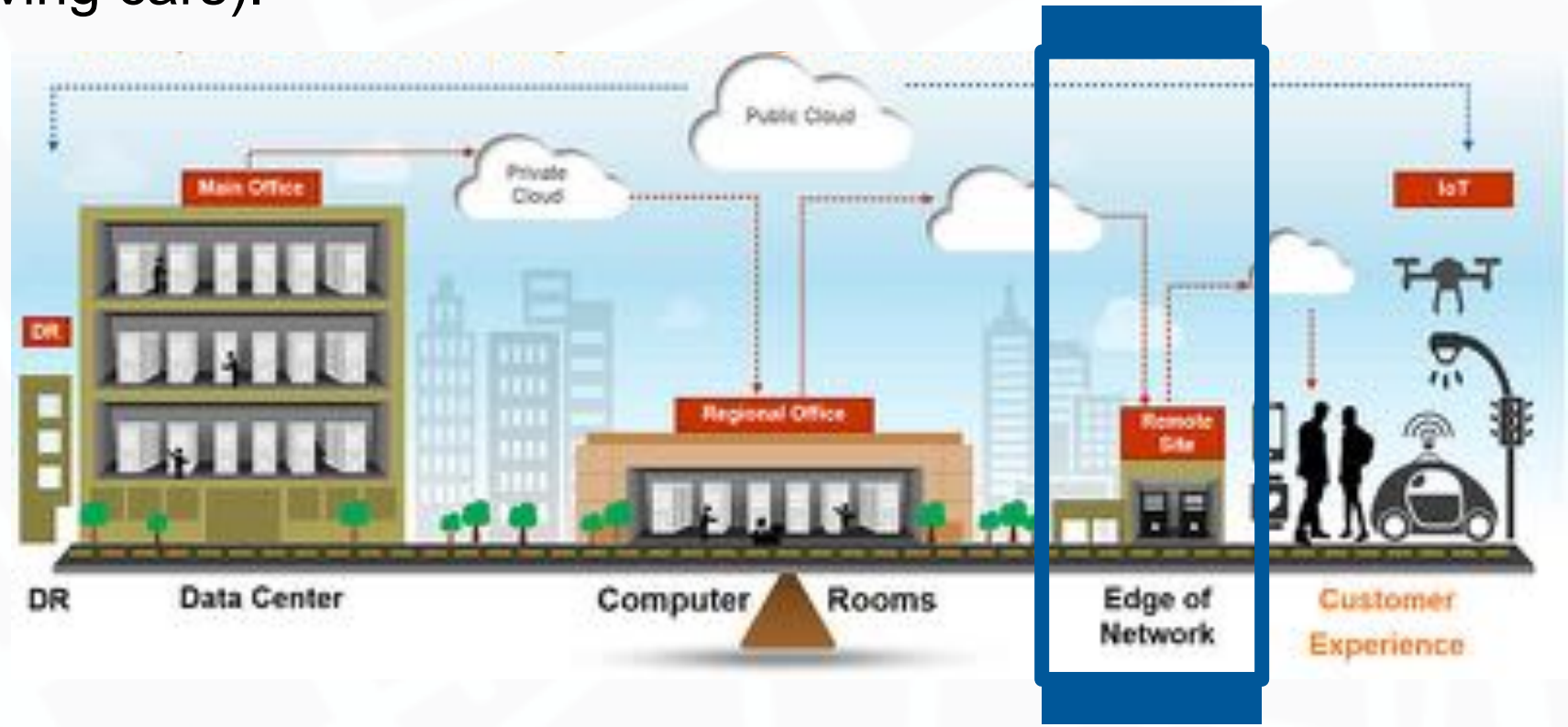


Global Support
Regional Coordination & Support

Types of Data Centres and Cooling Solutions

Edge Computing

Criticality of Content – From low (streaming movies) to high (self-driving cars).



EUROVENT MIDDLE EAST

HVACR Leadership Workshops

Edge Computing

Data Centre Needs:

- Modular, close to customers
- Scalable
- Smaller tonnages
- Continuous operation with little to no intervention
- Operated remotely and with automation in mind
- Maintain both power and cooling at all times
- Reliability – Redundancy

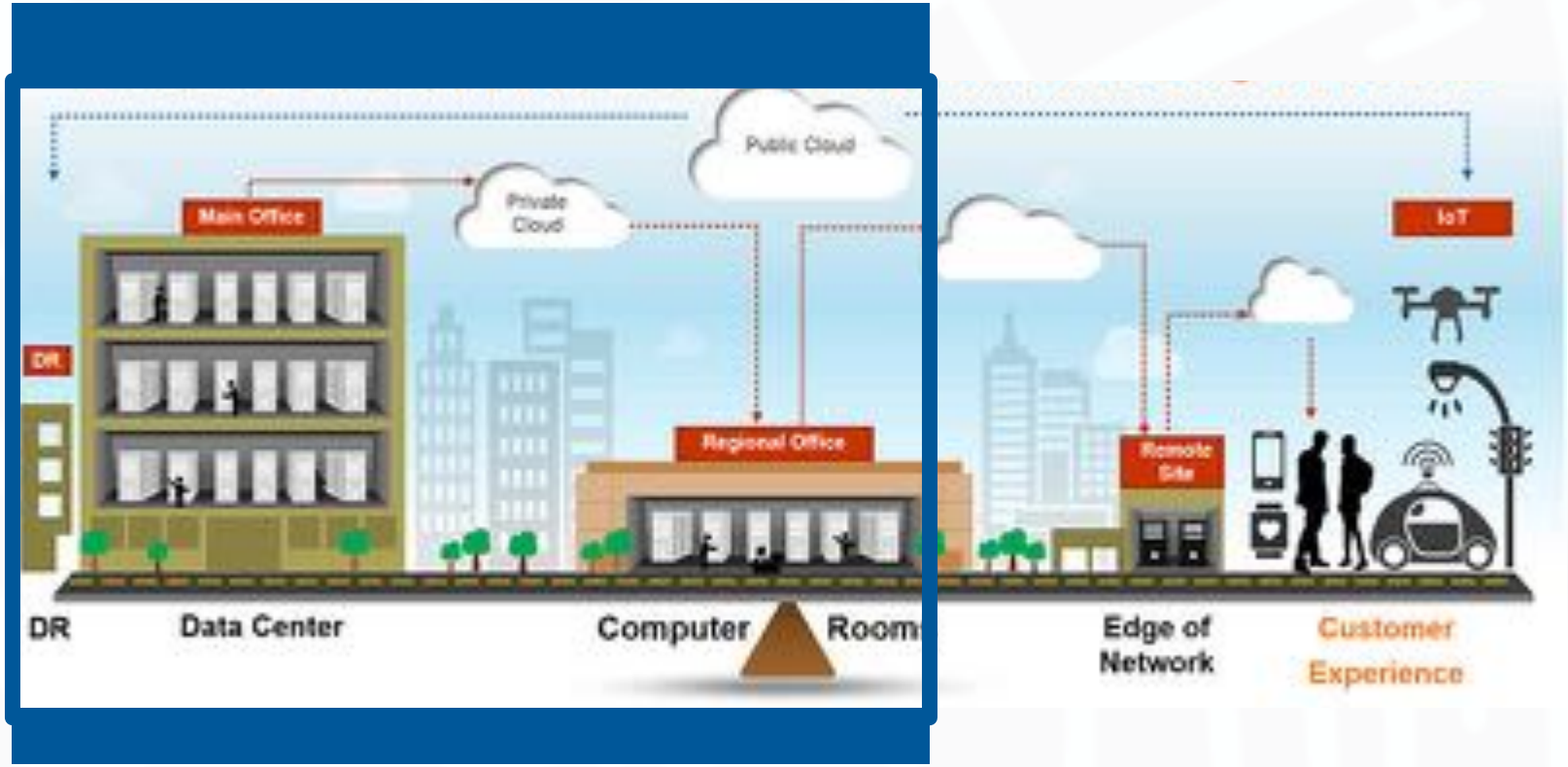
Cooling solution needs to be :

- Modular flexibility/installation
- Less than 20 tons (88 kW)
- “Self-contained” product
- Optimize energy and water usage
- Fan/Motor redundancy
- Limited - no maintenance
    - Quick easy access to key components

Edge Computing

Solution – Modular, hybrid evaporative cooler

Enterprise, Co-Location or Cloud Data Centres



Large, dense, scalable warehouses of computer architecture.

EUROVENT MIDDLE EAST

HVACR Leadership Workshops

Enterprise, Co-Location or Cloud Data Centres

Data Centre Needs:

- Dense capacity
- Critical facility
- Maintain both power and cooling at all times
- Energy efficiency (reduce energy cost/carbon footprint)
- Scalability
- Co-location – Takes time to rent data centre
- Fast and quality construction

Cooling solution need to be:

- Cooling capacity ranging from 500 to 5000+ tons (2,200 to 22,000 kW)
- Maximum cooling at lowest system energy and footprint
- Redundant critical components
- Factory assembled
- Partnership
- Local support before and after-sale
- Global network
- Application expertise – control strategies

Open Cooling Towers

Cross flow, axial fan, induced draft

Cross flow, axial fan, induced draft
(Single air intake)

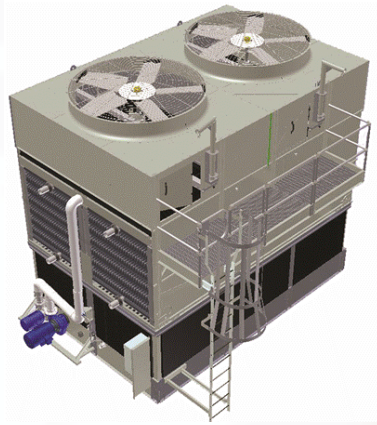
Counter flow, centrifugal fan,
forced draft
(single air intake)

Counter flow, axial fan,
induced draft

Closed Circuit Cooling Towers

Combined flow, axial fan, induced draft

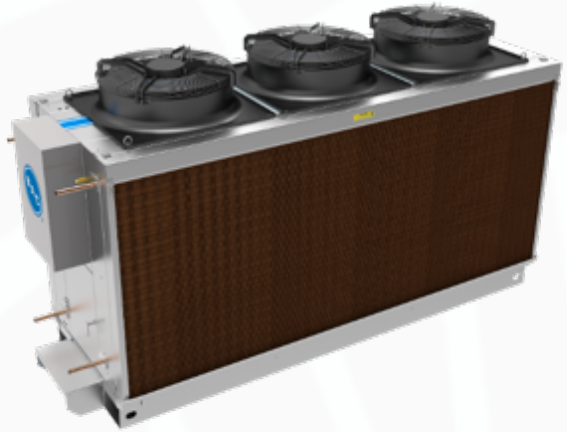
Counter flow, centrifugal fan, induced draft



Counter flow, axial fan, induced draft

Hybrid Coolers

Modular Hybrid cooler
Counter flow, radial fan, forced draft



Adiabatic cooler
Counter flow, adiabatic pre-cooling, axial fan, induced draft

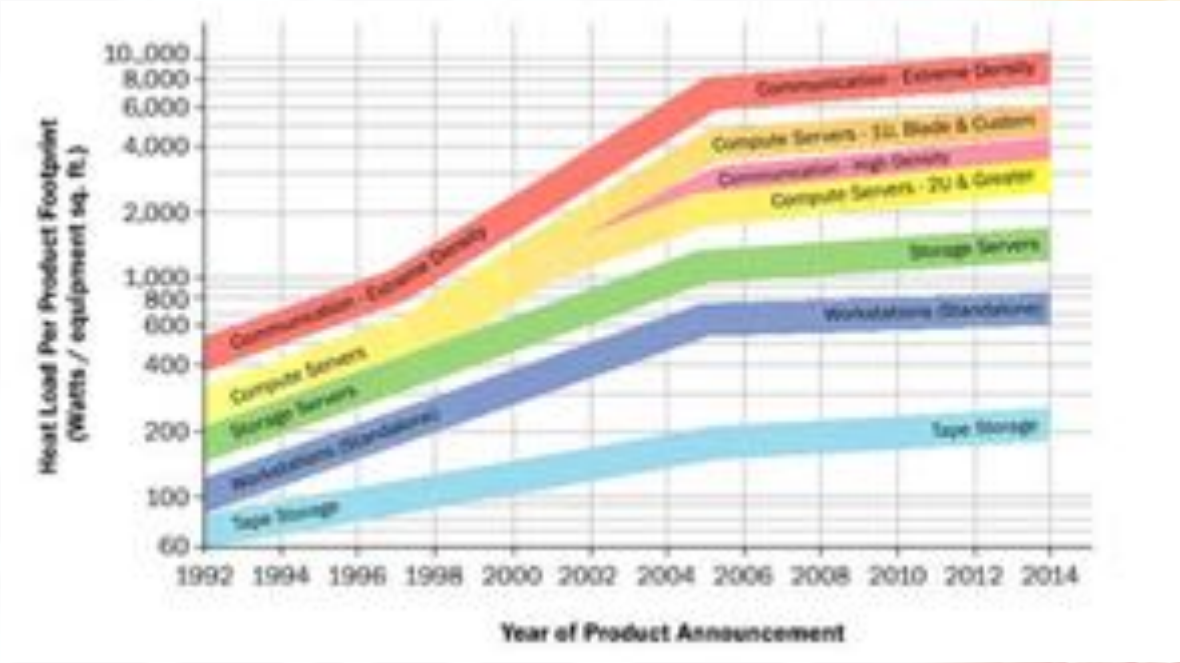
Hybrid cooler
Combined flow, axial fan, induced draft

Data Centre Trends

Data centres support major IT innovation trends:

Cloud computing, Artificial Intelligence applications, high-performance computing (gaming and IoT applications), engineering simulation, open-source services (wikipedia), online data mining, ..

- larger heat rejection required per product footprint
- components allow higher operating temperatures

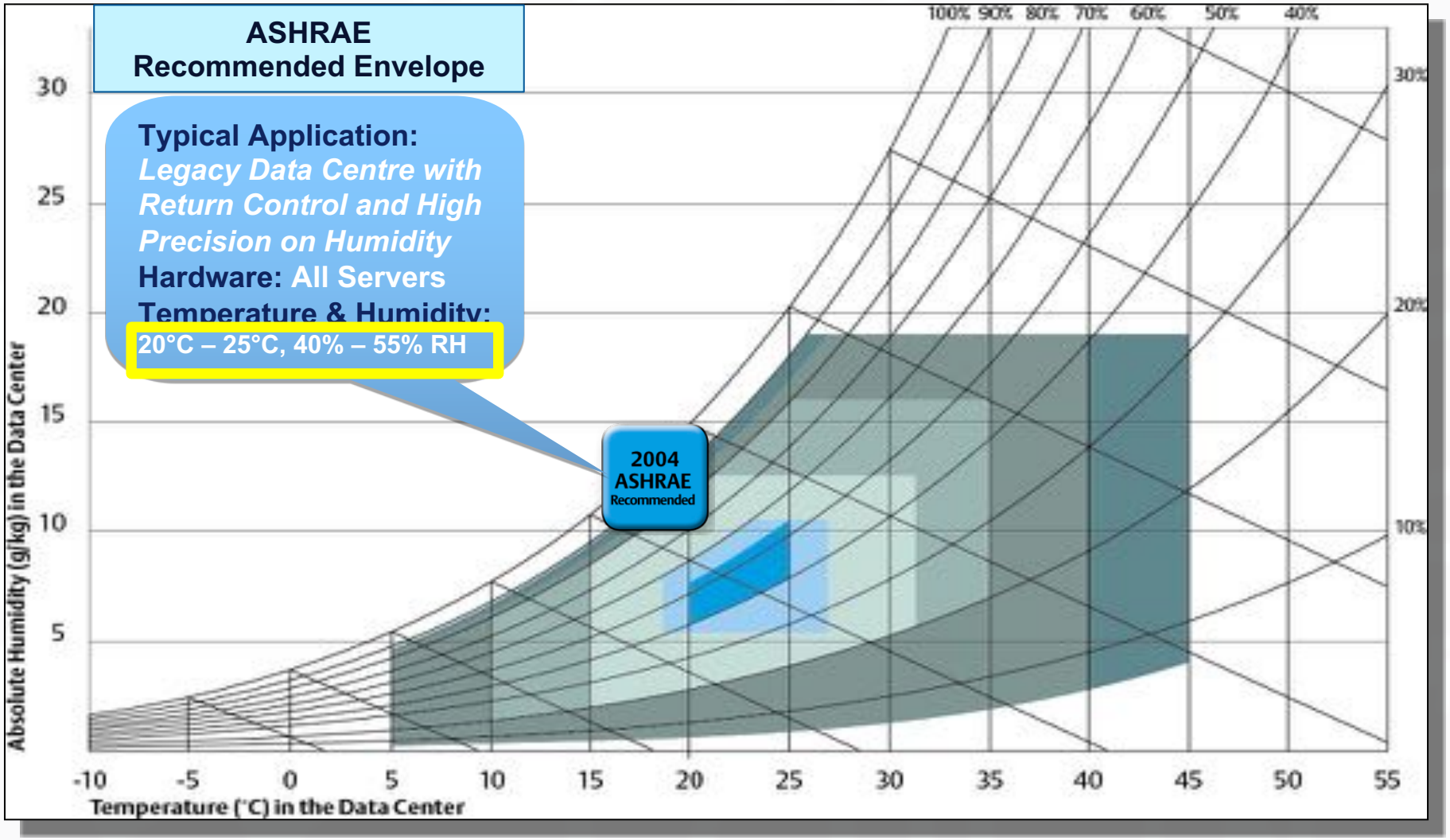


Source: ASHRAE

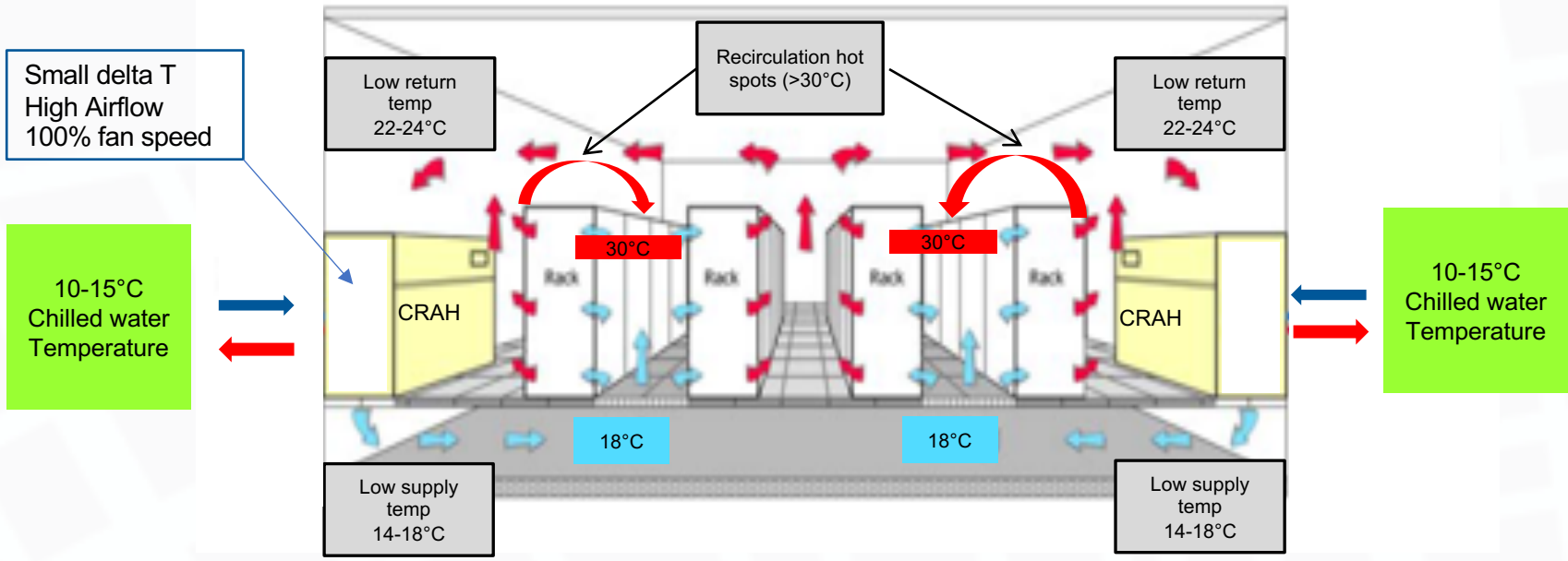
EUROVENT MIDDLE EAST

HVACR Leadership Workshops

Data Centre Operating Thresholds



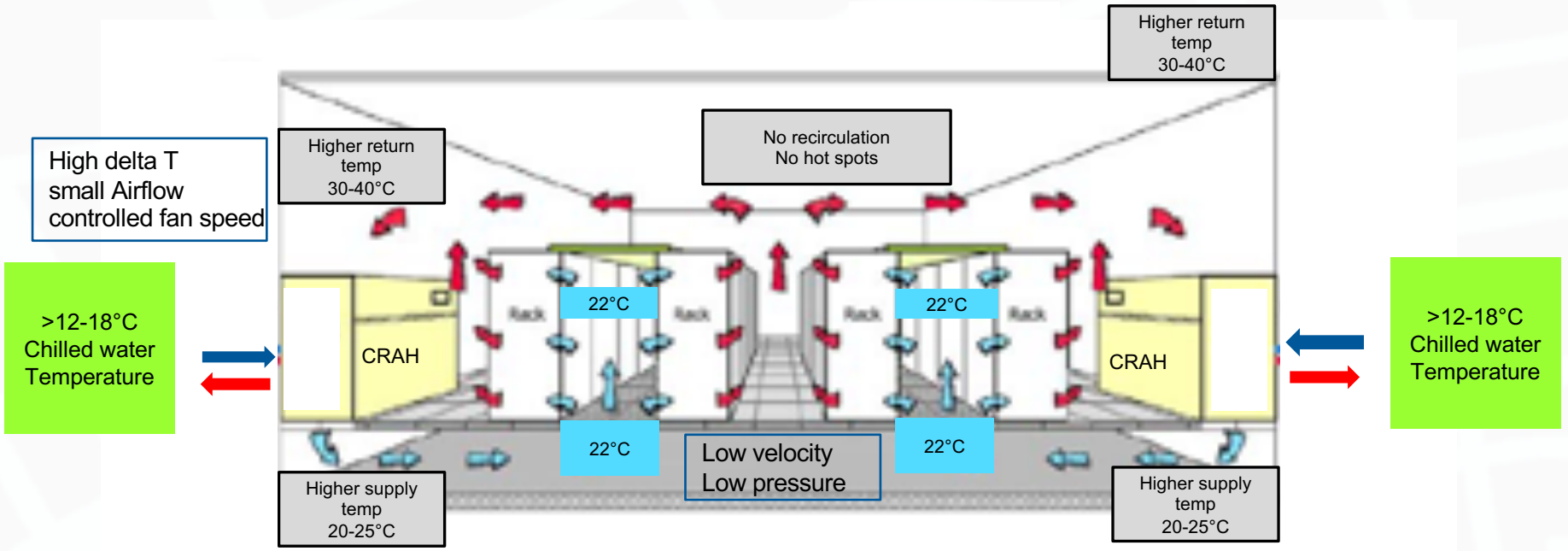
Traditional Air Cooling



Traditional Air Cooling

Hot/Cold Aisle Containment

- Data centres use optimal air distribution



Hot – Cold Aisle Separation

ASHRAE TC 9.9

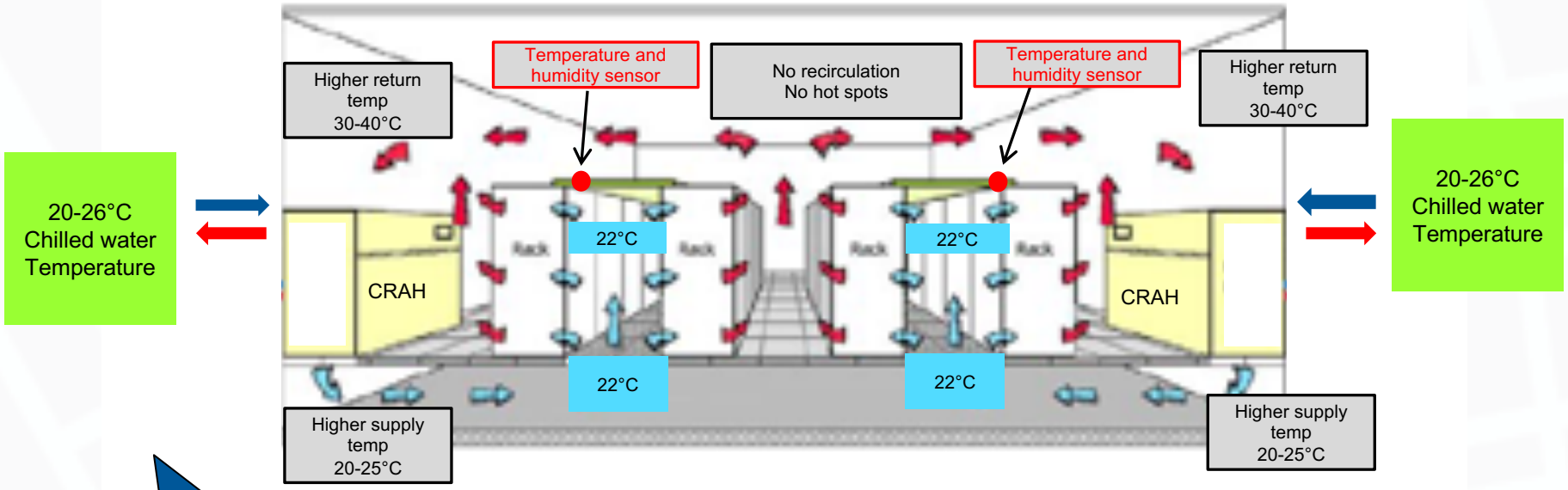
- Data centres support major IT innovation trends: Cloud computing, Artificial Intelligence applications, high-performance computing(gaming and IoT applications), engineering simulation, open-source services (Wikipedia), online data mining, ...
  - larger heat rejection required per footprint
  - components allow higher operating temperatures
- Data centres use optimal air distribution/temp control systems
- Data centre designs allow increased data centre operating temperatures and humidity envelopes as per ASHRAE TC 9.9 recommendations
  - Recommended range: 18-27°C (64,4°F-80,6°F)
  - Allowed range: 15-32°C (59°F-89,6°F)

Effects of increase in CW Temperatures

- Smaller and more efficient chiller
  - CAPEX and OPEX savings (Low PUE)

- Eurovent Certified, high efficiency evaporative cooling equipment allows even smaller chillers (low cond. temp @ 3-4°C approach)
  - higher CAPEX & OPEX savings (Lowest PUE, with long free cooling period)

Hot /Cold Aisle Containment & Air Flow Control



Allowing Year Round Free cooling with certified evaporative cooling equipment (depending on climate conditions)

Free Cooling

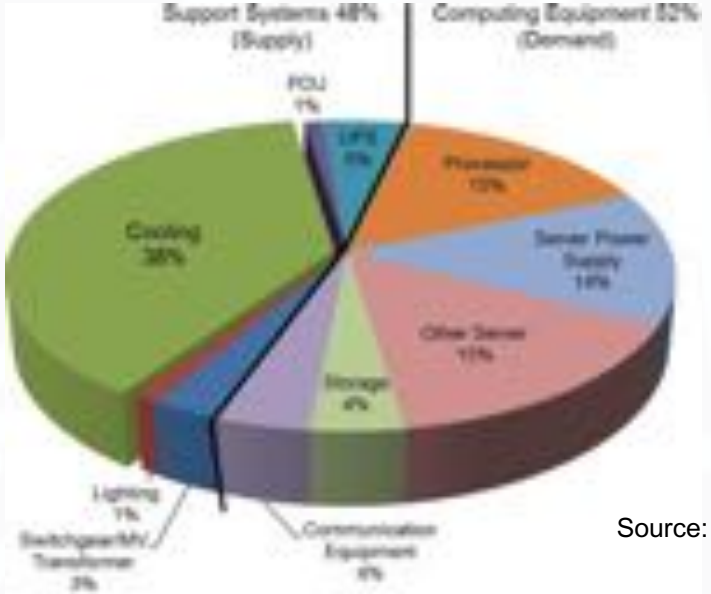
EUROVENT MIDDLE EAST

HVACR Leadership Workshops

Free Cooling: What and Why?

- Freecooling: Reducing the use of chillers by using only the cooling tower to cool the chilled water

- Where does data centre power go?

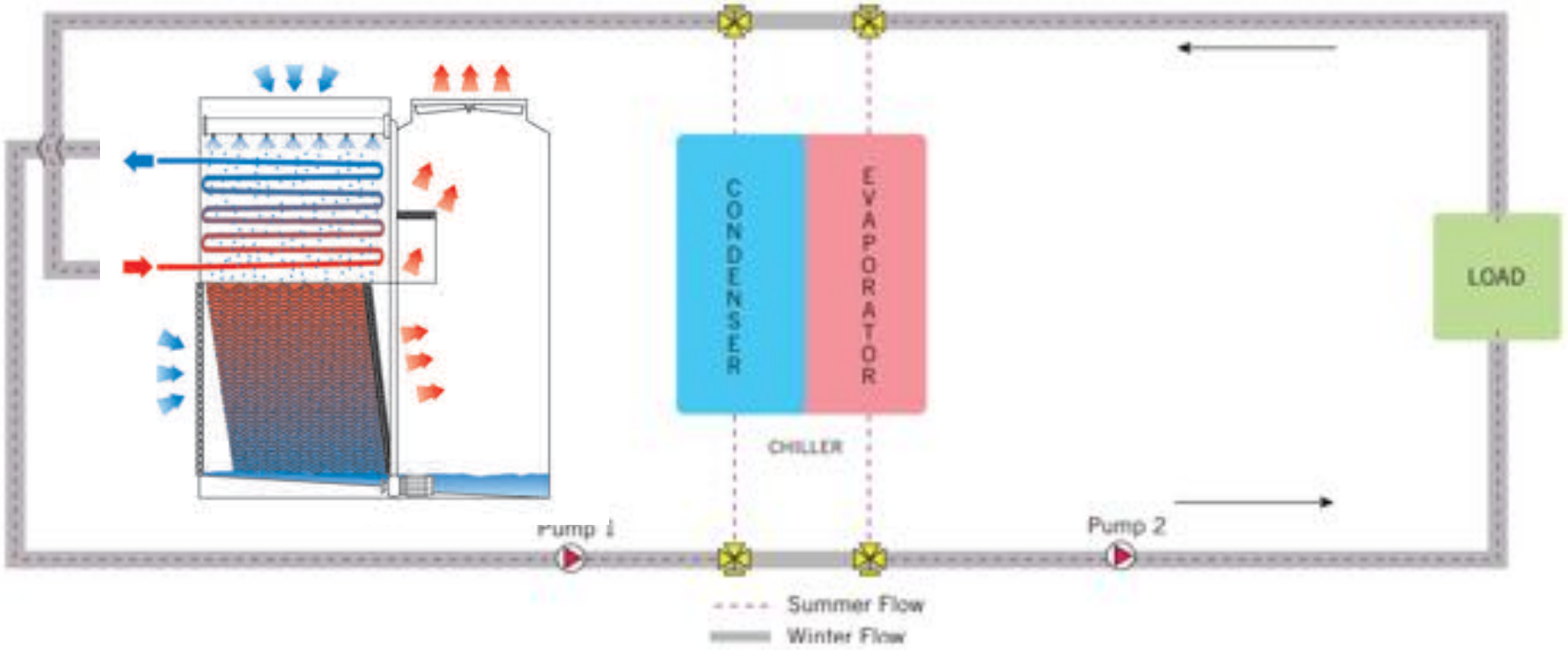


Source: Science Direct

EUROVENT MIDDLE EAST

HVACR Leadership Workshops

Free cooling with closed circuit coolers



- Simplified system – less components
- Closed loop – no fouling and minimal pump energy

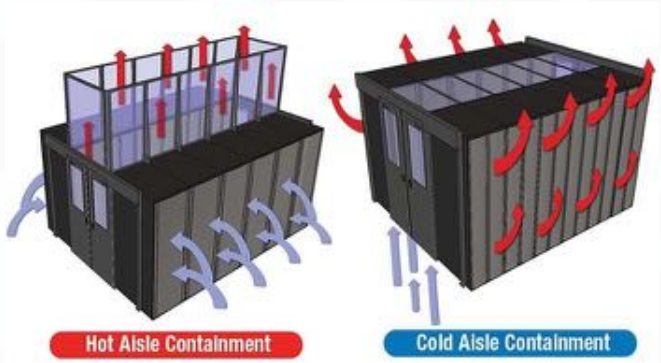
	Chiller	Cooling Tower
Summer	12°C/7°C	32°C/27°C
Winter	-	12°C/7°C

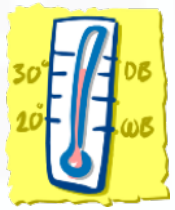
Benefits of Free Cooling

- Higher Efficiency
- Higher Reliability
- Higher Availability and Capacity
- High Energy savings

Factors that impact free cooling operation

- Geographic location
  - Weather data (ASHRAE,...)
- Separation of hot and cold air streams
  - No separation in old DC's
  - New DC: hot or cold aisle
- Set points of the cooling system
  - Server Inlet temperature
- Type of cooling technology
  - Evaporative cooling uses Twb





Typical 10°C difference between wet bulb and dry bulb

Key Takeaways

Evaporative cooling provides an efficient cooling solution for data centres by providing and improving:

RELIABILITY

LOW MAINTENANCE AND EASY INSPECTION

ENERGY EFFICIENCY

SUSTAINABILITY

Mr Tom Bosmans

Application Manager

Baltimore Aircoil International nv.

tbosmans@baltimoreaircoil.be

BALTIMORE
AIRCOIL COMPANY