How to Safely Avoid Overcooling
Your Data Center
and **Save Money Today**

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Abstract

Worldwide demand for new and more powerful IT-based applications, combined with the economic benefits of consolidation of physical assets, has led to an unprecedented increase in data center density.

Data center professionals are being asked to be more efficient with their resources including energy and cooling. The methods used to manage your data center energy and cooling may no longer be sufficient.

Read this eBook to find out how you can improve your efficiency without sacrificing uptime.

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How to **Safely Avoid Overcooling** Your Data Center and **Save Money Today**

Energy Usage Today

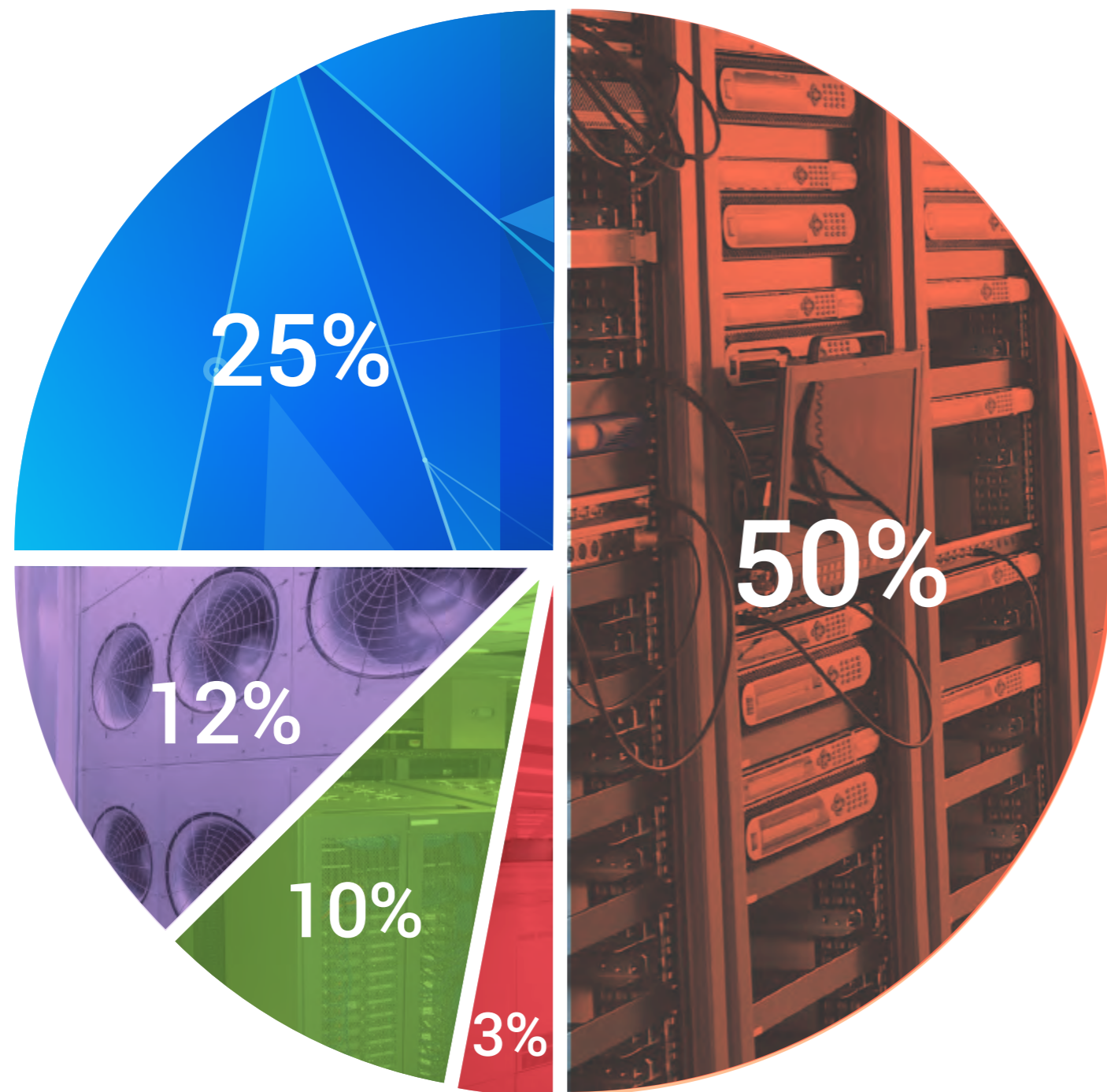|	
🖥️	IT equipment - **50%**
❄️	Cooling - **25%**
〰️	Air Movement - **12%**
⚡	Electricity Transformer/UPS - **10%**
💡	Lighting - **3%**

Source: EYP Mission Critical Facilities Inc., New York

**37% of energy consumed by moving and cooling air.
You can easily improve efficiency by not over-cooling!**

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Cost of Cooling Today

	Racks	1,000
	Power/Rack **KW**	5
	IT Power **KW**	5,000
	Data Center Power **KW**	10,000
	Cooling & Air Movement Power **KW** 37%	3,700
	Hours in a Year	8,760
	Cooling & Air Movement Energy/ Year **KW-HR**	32,412,000
	Cost per **KW-HR**	$0.10
	Cooling & Air Movement Power **Cost/Year**	$3,241,200

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Common Methods of Saving Energy

○ **Reduce air mixing via hot/cold air separation through**
   - reduced bypass airflow
   - blanking plates
   - raised floor grommets

○ **Optimize floor layout (CFD)**

○ **Closely couple supply and returns for the IT load**

○ **Provide higher voltage to racks, reduce step downs**

○ **Use air side economizers & cooling towers**

○ **Deploy virtualization**

○ **Implement power save mode**

○ **Upgrade technology**

○ **Decommission servers**

○ **Bill-back power to drive behavior**

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Cooling Chart & Temperature Monitoring Application

- Collect temperature and humidity data

- Show if compliant with ASHRAE® Standards

- Calculate potential savings

- Notify if too hot

- Chart trends over long periods of time

Dry Bulb Temperature in Degrees (°F)
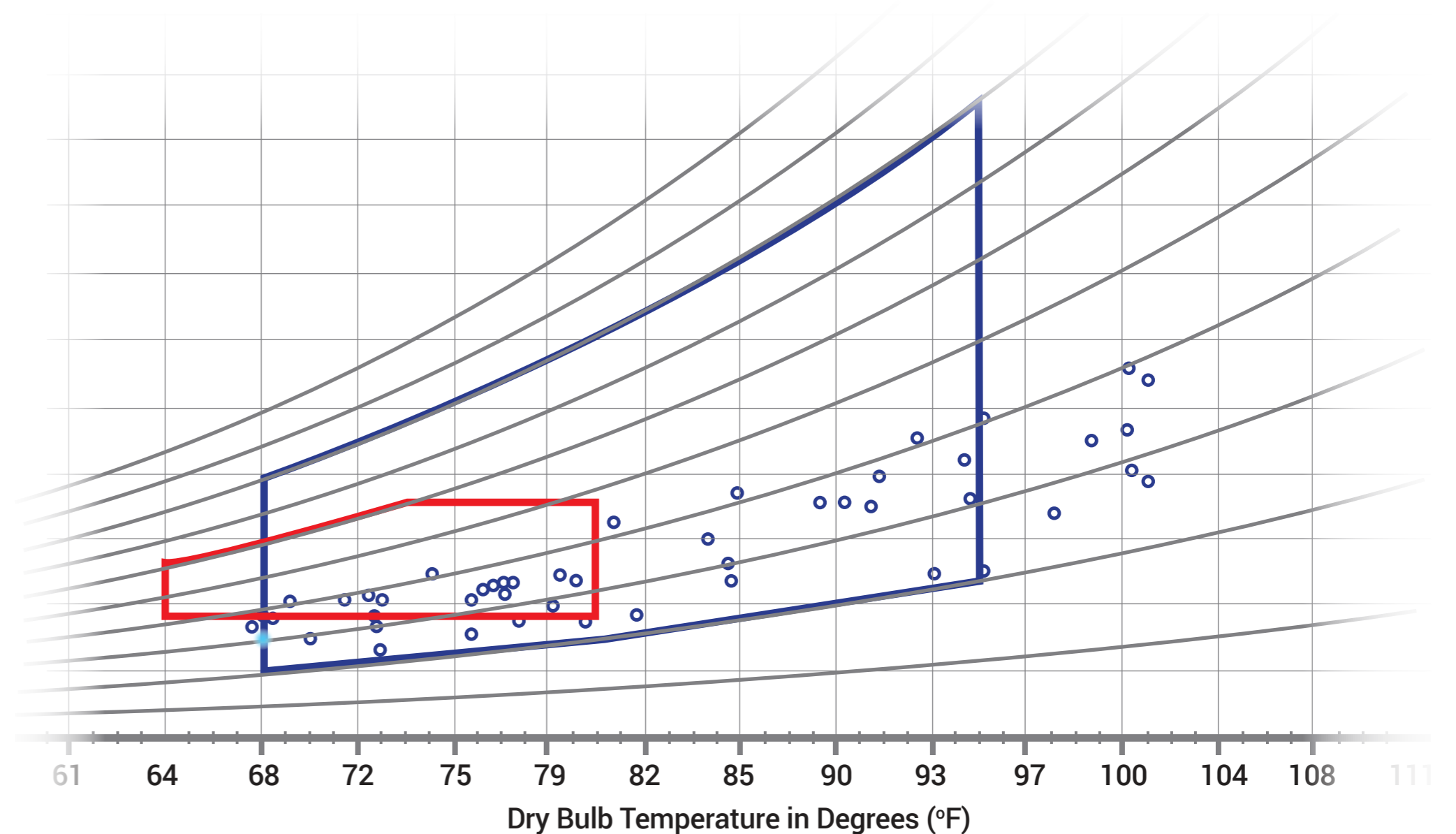
Expanded envelope allows you to operate in the most energy efficient mode and still achieve the reliability necessary as required by your business.

- "So overall, increasing the temperature by 5°C a very small change in reliability. The "reward" side of this equation is in the energy and potential capital savings that data center operators can get. In climates like Toronto or Denver, operators can gain 1000s of hours of economizer operations by increasing the set point top temperature. There is even the possibly of eliminating or significantly down-sizing the chilled water system, saving millions in CAPEX and OPEX over the life of the data center."*

* RELIABILITY AND TEMPERATURE: HOW BIG IS THE X-FACTOR?
   Published on 13th November 2013 by Mark Monroe

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Tools to Measure Environmental Conditions

Suboptimal

- **Manual Site Measurements**
  Person going to measure looking at display or thermometer and recording it

Optimal

- **Automated Data Collection and Information Presentation**
  - IP-based rack environment monitoring appliances
  - **Environmental monitoring integrated with Intelligent Power Distribution Units (iPDU)**

Temperature

Humidity

Water

Air Flow

Pressure Differential

Smoke

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Precise Sensor Technology Required

## Continuous monitoring of temperature and humidity

- Look for sensors that poll external temperature and humidity sensor often, example every few seconds

- Measure, test and report temperatures across a large range, for example -13°F to 149°F

- Support customized thresholds - critical, lower warning, normal, above normal, and critical thresholds for sensors - which can be customer set

- Ensure sensors meet MIL specifications for MTBF of >500,000 hours

Precise sensors are key to providing accuracy.

- Accurate measurement of temperature and humidity is essential to ensure proper monitoring

- Ensure sensors work across large distances from the PDU, or environmental monitoring appliance, for example 100 feet

- Humidity sensors tend to drift about 5% per year. Replaceable heads will enable humidity sensors to remain accurate

Ensure sensor placement

- Place sensors as per ASHRAE recommended sensor placement.
  - top, middle, and bottom of the rack inlets

- Place sensors on the rear exhaust to understand ∆T's or containment temperatures.
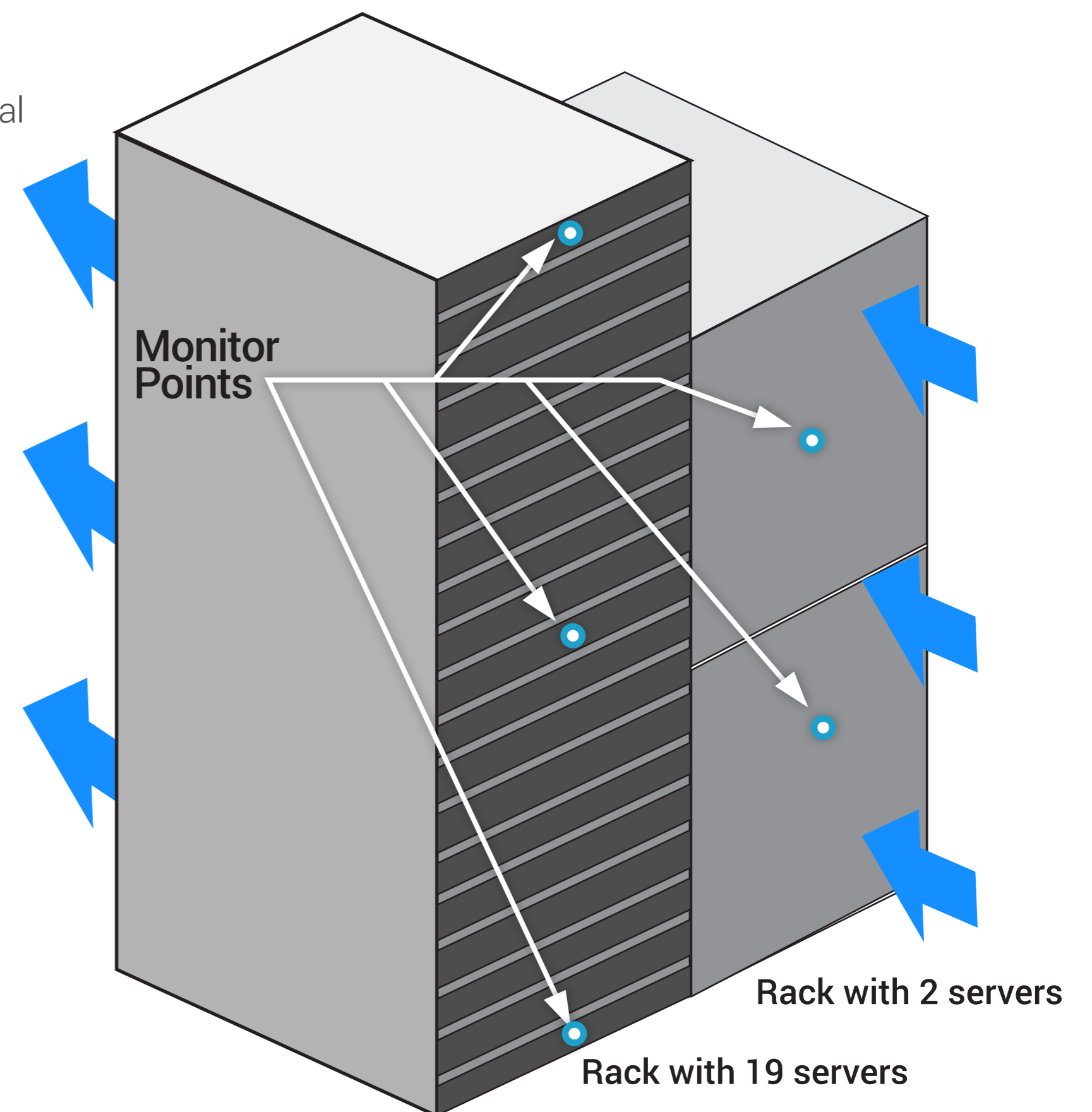
Monitor Points

Rack with 2 servers

Rack with 19 servers

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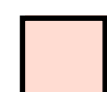
ASHRAE® Guidelines Enhanced

ASHRAE® new recommended operating environment
THE THERMAL ENVELOPE HAS INCREASED!!!

These environmental envelopes pertain to air entering the IT equipment

Wet Bulb Temperature (°F)- slanted

Dew Point Temperature (°F)- horizontal

- Class A4 Allowable Envelope
- Class A3 Allowable Envelope
- Class A2 Allowable Envelope
- Class A1 Allowable Envelope
- Class A1-A4 Recommended Envelope

Relative humidity
90% 80% 70% 60% 50% 40% 30%

Humidity Ratio - grams of moisture per kilogram of dry air
20
15
10
5
0

Saturation temperature (°F)

Dry bulb temperature (°F)
0   50   65   85   105   125
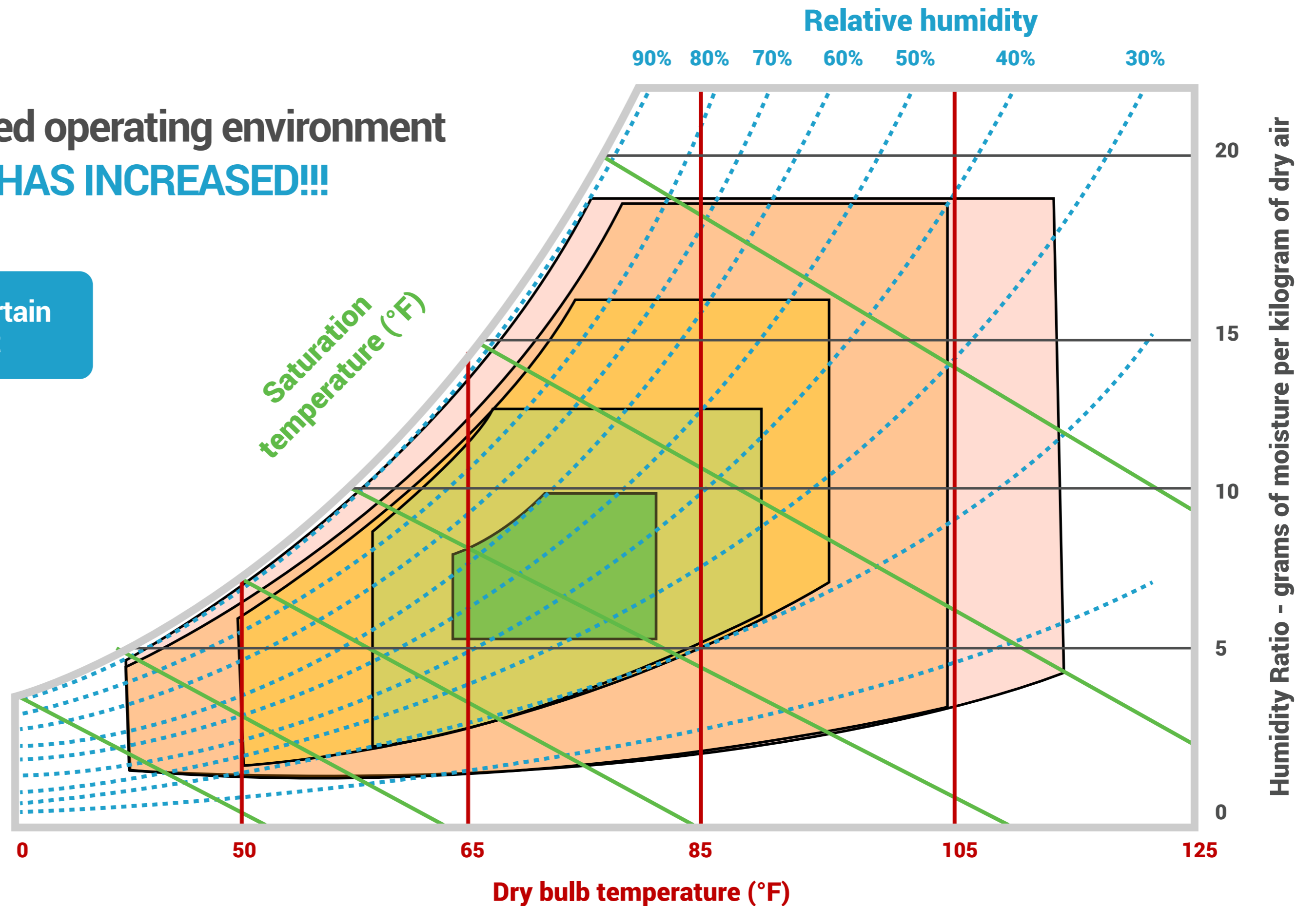
Expanded envelope ensures you are operating efficiently & reliably

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ASHRAE® Guidelines Enhanced*

- ASHRAE Classes A3 and A4 have been added to expand the environmental envelopes for IT equipment. ASHRAE Classes A1, A2, B and C are identical to the 2008 version of Classes 1, 2, 3 and 4. Also, the 2008 recommended envelope stays the same.
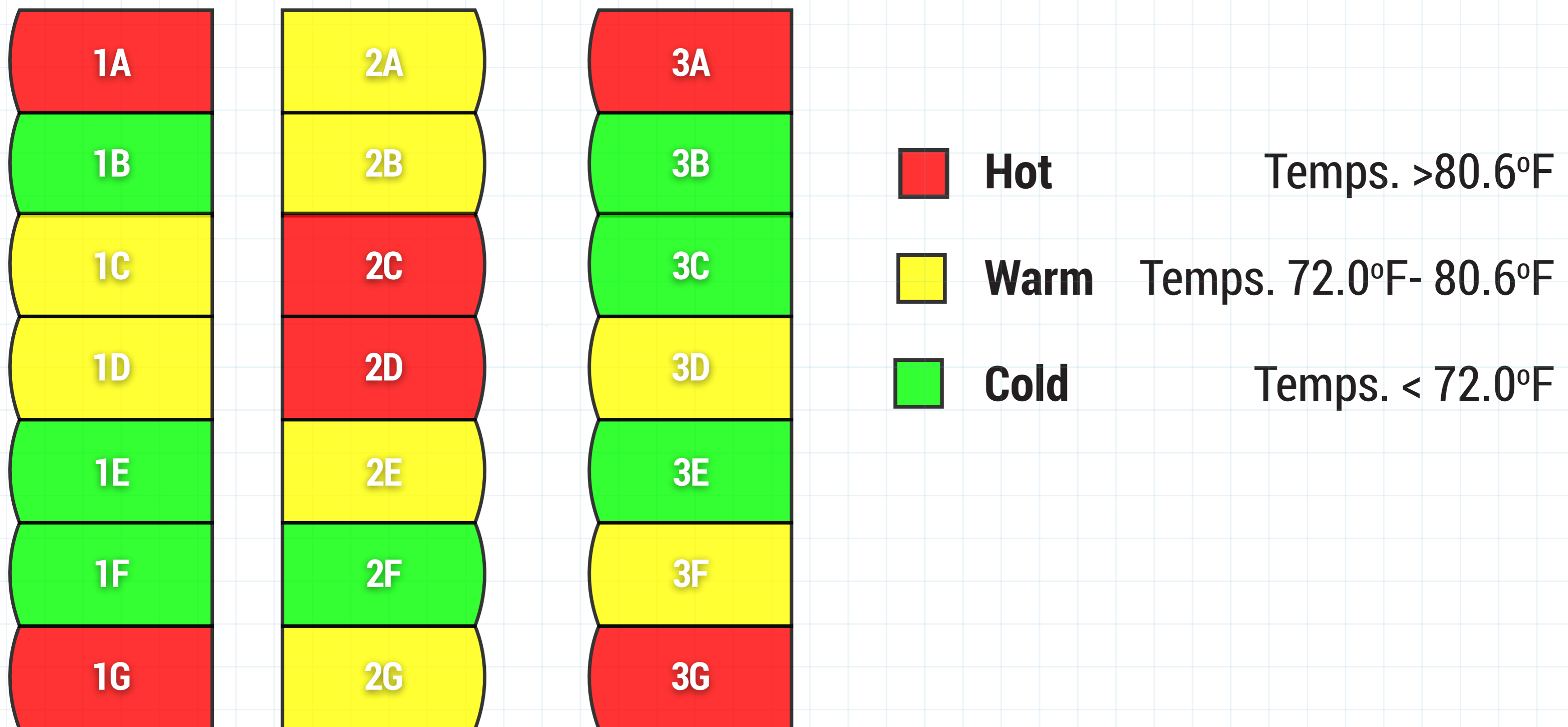
- ASHRAE Class A3 expands the temperature range to 5°C (41°F) to 40°C (113°F) while also expanding the moisture range from 8% RH and -12°C dew point to 85% relative humidity.

- ASHRAE Class A4 expands the allowable temperature and moisture range even further than A3. The temperature range is expanded to 5°C (41°F) to 45°C (113°F) while the moisture range extends from 8% RH and -12°C dew point to 90% RH.

*Source: ASHRAE TC9.9 Data Center Networking Equipment – Issues and Best Practices Whitepaper

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Easily Identify Trouble Spots

Use DCIM tools to collect sensor data and easily see hot spots or overcooling.

1A	2A	3A
1B	2B	3B
1C	2C	3C
1D	2D	3D
1E	2E	3E
1F	2F	3F
1G	2G	3G

Hot — Temps. >80.6°F

Warm — Temps. 72.0°F - 80.6°F

Cold — Temps. < 72.0°F

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Use DCIM tools to easily see if you are operating within the new ASHRAE ® guidelines or within your custom thermal and humidity envelopes.

Cooling Chart - Jersey City Data Center

Temperature (°F)

Moisture Ratio
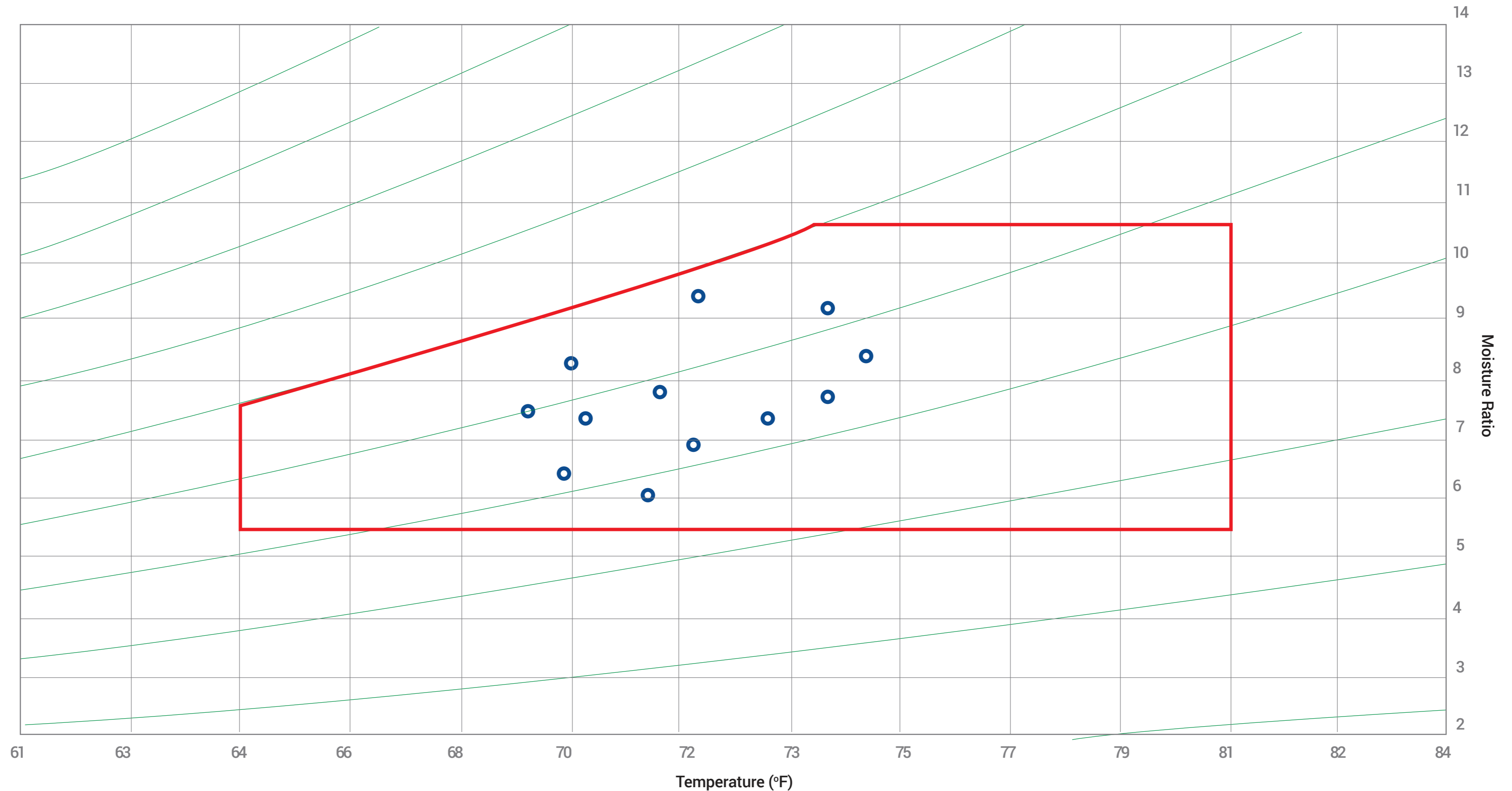
Potential Cooling Energy Savings: 20%

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Estimate how much you might save?

*"Data center managers can save up to **4 percent in energy costs** for every degree of upward change in the baseline temperature, known as a set point. The higher set point means less frequent use of air conditioning, which saves the energy used to run cooling systems"*

David J. Cappuccio, Gartner managing vice president and chief of research for the Infrastructure teams

Using the figures from the earlier slide *"Cost of Cooling Today"*

IT Power **KW**	5,000
Data Center Power **KW**	10,000
Cooling & Air Movement Power **Cost/Year**	$3,241,200

A **2°** increase in the ***set point***, results in a ***8% savings in energy cooling costs*** (4% for each degree)

(Before Change) Cooling & Air Movement Power **Cost/Year**	$3,241,200
8% savings	$259,296
(New) Cooling & Air Movement Power **Cost/Year**	$2,981,904

Total Annual Savings = $259,296

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Trending and Forecasting Charts to mitigate long term risk and help with planning

Threshold Violation Alerts to Know if You have an Incident

From: **DCIM**
To: Data Center Manager

Critical Temperature Alert
April 1 at 9:22 AM

A **Critical Over-Temperature condition** has been reached.

Rack: 15

Threshold: 80.6°F

Current Temperature: 83°F

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15
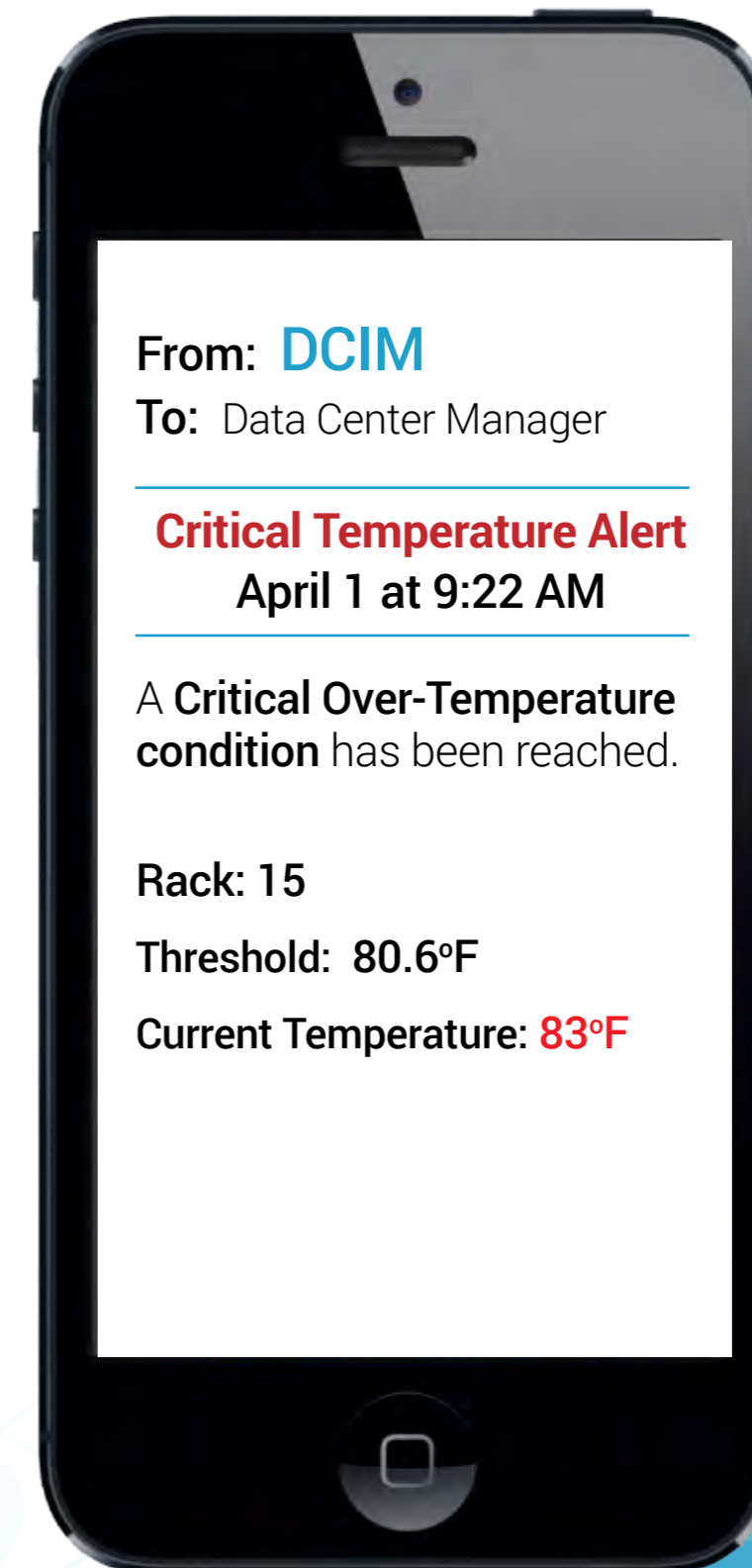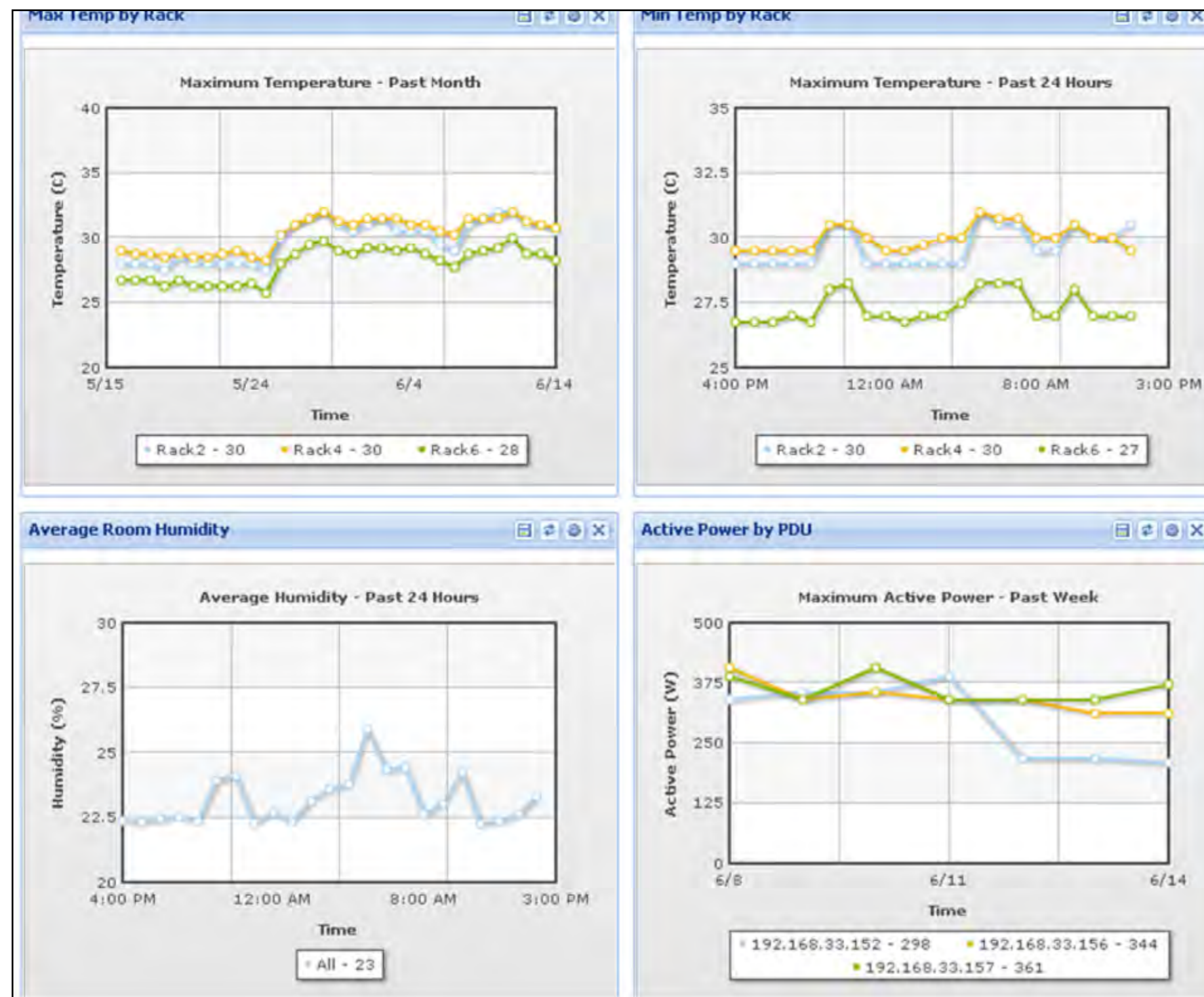
Summary Recommendations

1. Instrument the data center so you can understand temperatures coming into IT equipment.

2. Set appropriate rack inlet thresholds so that you can get alerts for over temperature conditions.

3. Check Cooling Chart to determine if you are Compliant with ASHRAE® recommendations and how much you might save by avoiding over cooling.

4. Slowly raise CRAH/CRAC set points to ASHRAE® recommended guidelines. Check cooling charts after raising set points to ensure that you are safely within guidelines. Sometimes you can even turn off CRAH/CRAC in lieu of or in addition to raising set points.

5. Periodically check trends and heat map for high level overviews.

6. Adjust where necessary.

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Take the next step with Sunbird

Take a Test Drive

Test Drive Now

Schedule a Demo

Schedule Demo

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