

Data Center Thermal Balance Audit

Date: 20.11.2022

Report ID: 457

Title: Sample Data Center

Thermal Data: This report is based on high resolution infrared surface temperature measurements of rack inlets.



Standard Deviation: Rack Inlet Surface Temperature

Date: 20.11.2022
Report ID: 457
Title: Sample Data Center
Description: RM1

Measurement Count: 3763200

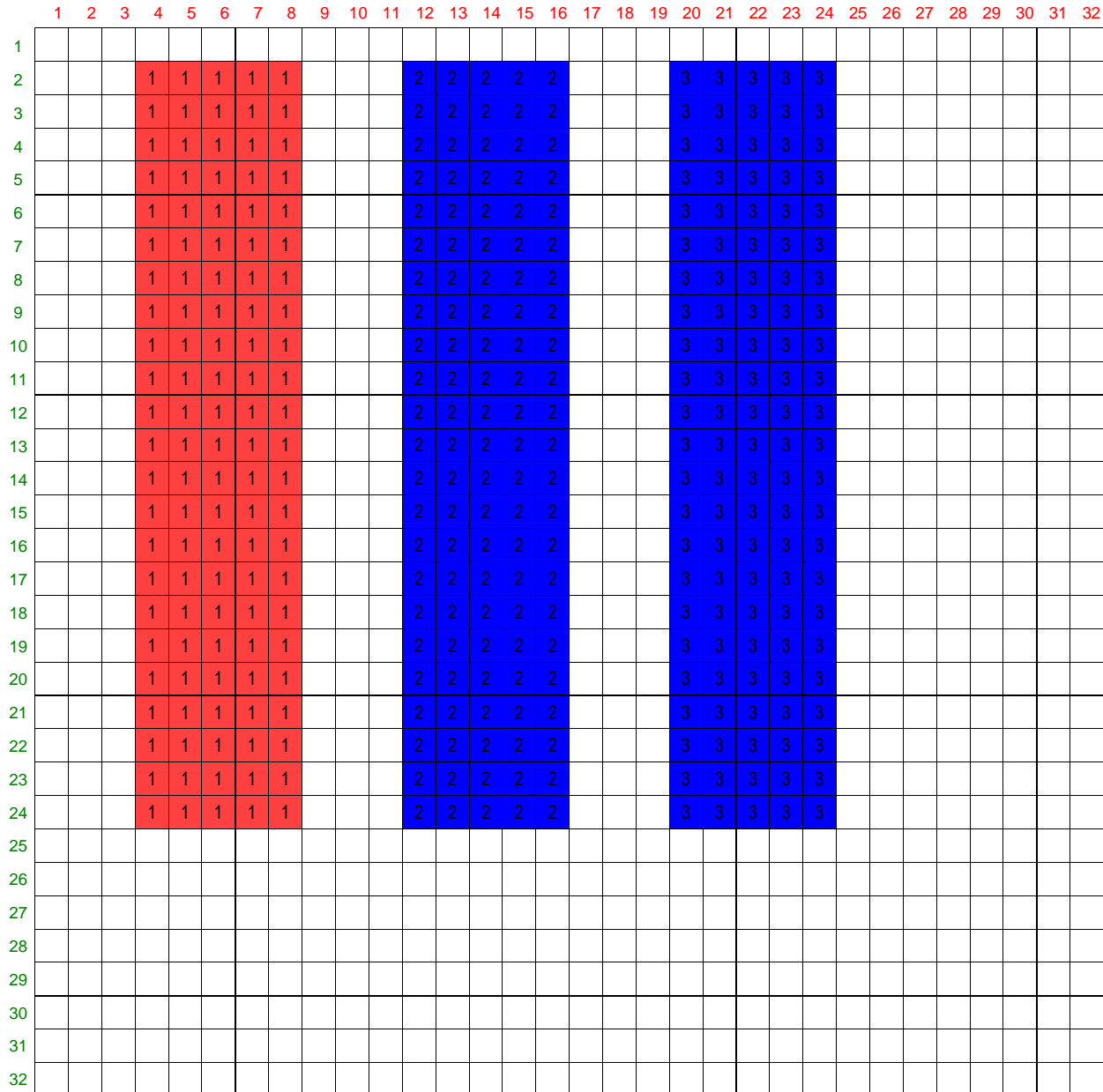
Floor Map

Standard Deviation (σ) in $^{\circ}\text{C}$:

1.86 $^{\circ}\text{C}$



3.5 $^{\circ}\text{C}$



Object Information

Object:

1/Containment 1/RM1

2/Containment 2/RM1

3/Containment 3/RM1

Measurement Time:

17.11.2022 13:31:07

17.11.2022 13:38:32

17.11.2022 13:43:35

Measurement Count:

1228800

1305600

1228800

Metrics: Rack Inlet Surface Temperature

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SET POINT CHANGE: This is how much temperature can be raised, with present infrastructure, while maintaining a LOW probability of hot spots. IMPORTANT: When raising room temperature we recommend that equipment be closely monitored for hot spots.

POTENTIAL SAVINGS: ASHRAE recommends a server inlet temperature of 27 °C. Studies show that data centers can save about 9 % in energy costs for every 1°C increase in server inlet temperature (5% for each 1°F). To calculate "Potential Savings" we use the following formula:

$(27\text{ °C} - \text{High Range}) * 9$

Temperature Metrics

Object:	AVG:	Range:	SD (σ):	Setpoint Change:	Potential Savings:
1/Containment 1	19.42°C	12.41 - 26.43°C	3.5 °C	+ 0.57°C	5.14%
2/Containment 2	17.37°C	13.54 - 21.21°C	1.92 °C	+ 5.79°C	52.11%
3/Containment 3	18.05°C	14.33 - 21.78°C	1.86 °C	+ 5.22°C	46.96%

Temperature Distribution

Object:	-3σ	-2σ	-1σ	0 σ	1σ	2σ	3σ
	2.1%	13.6%	34.1%	34.1%	13.6%	2.1%	
1/Containment 1	8.9-12.4°C	12.4-15.9°C	15.9-19.4°C	19.4-22.9°C	22.9-26.4°C	26.4-29.9°C	
2/Containment 2	11.6-13.5°C	13.5-15.5°C	15.5-17.4°C	17.4-19.3°C	19.3-21.2°C	21.2-23.1°C	
3/Containment 3	12.5-14.3°C	14.3-16.2°C	16.2-18.1°C	18.1-19.9°C	19.9-21.8°C	21.8-23.6°C	

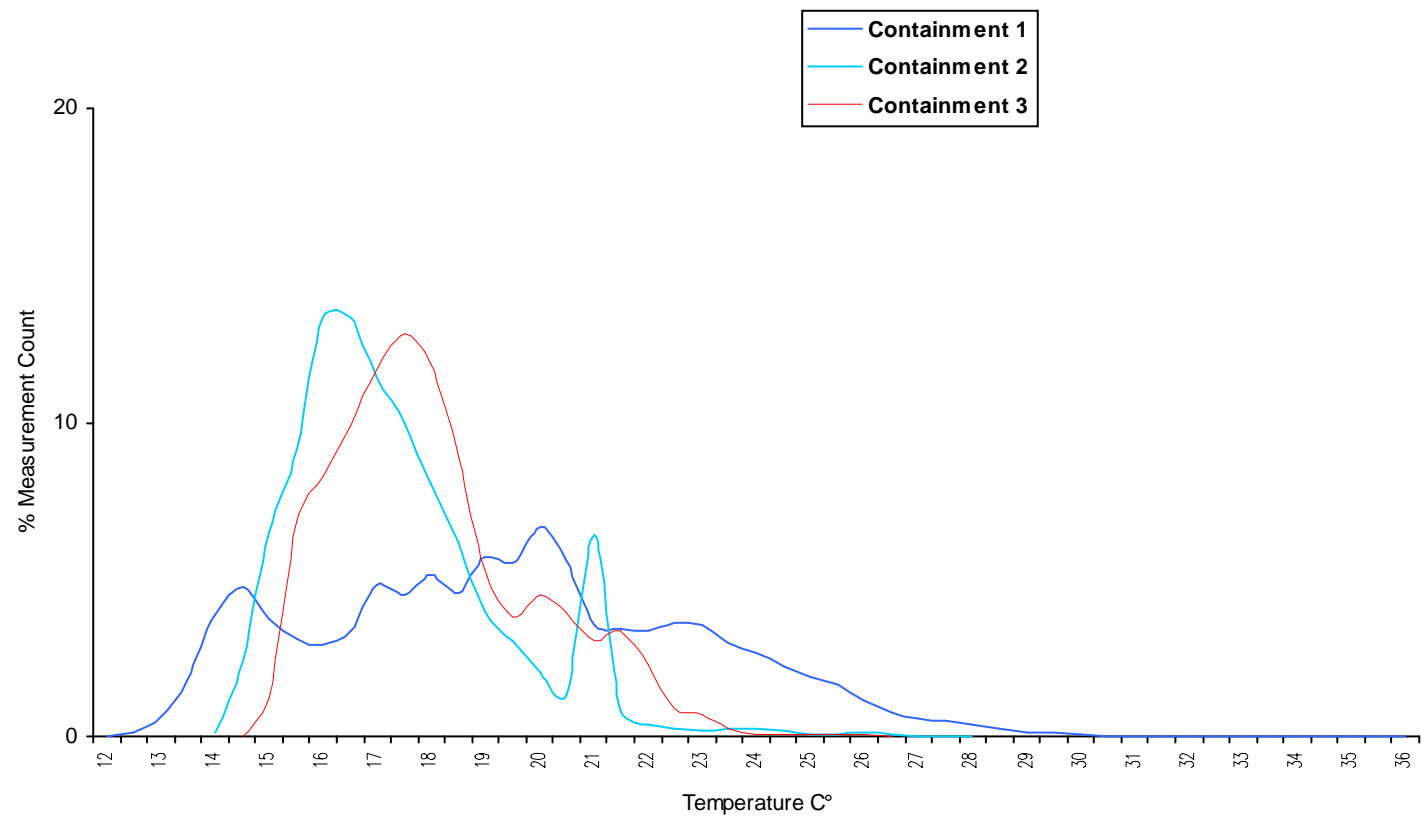
Object Information

Object:	Measurement Time:	Measurement Count:
1/Containment 1/RM1	17.11.2022 13:31:07	1228800
2/Containment 2/RM1	17.11.2022 13:38:32	1305600
3/Containment 3/RM1	17.11.2022 13:43:35	1228800

Histogram: Rack Inlet Surface Temperature

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3/Containment 3/RM1	17.11.2022 13:43:35	1228800



Avoid Downtime! A thermally balanced data center (low standard deviation σ) is less susceptible to downtime caused by CRAC failures and hot spots.



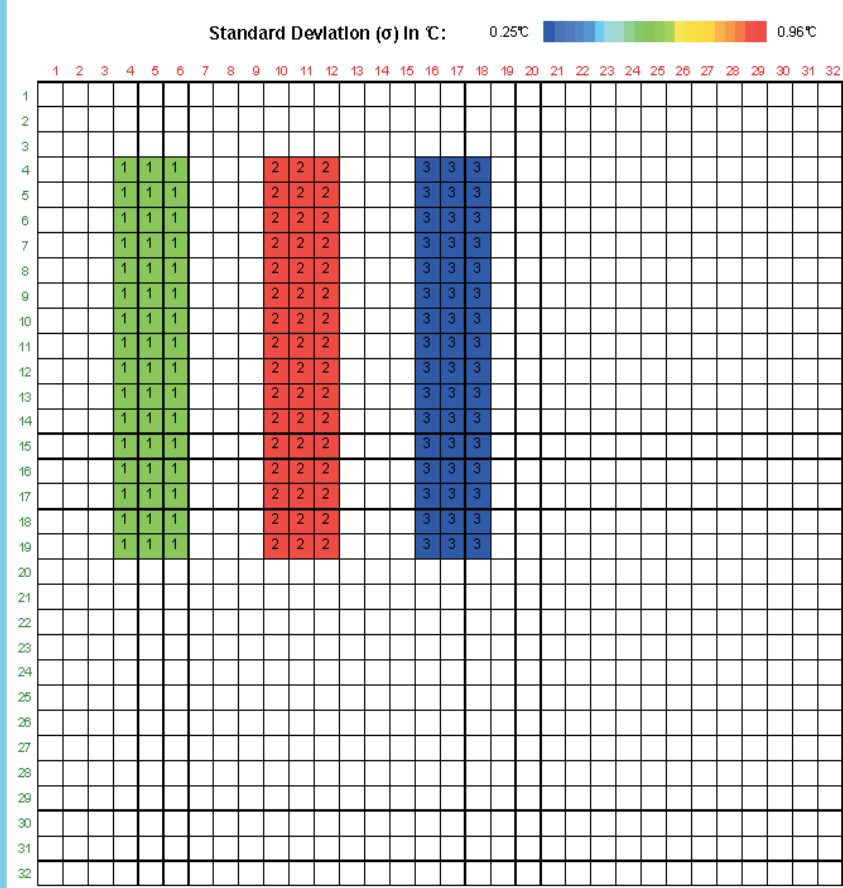
Save Energy Costs! Data centers can save 9% in energy costs for every 1°C increase in server inlet temperature!



Rack Inlet Air Temperature

Location: Data Center Date: 01.10.2022
Report ID: 445 Measurement Count: 304,790

Floor Map



ThermalCheckup™ is quick and cost effective. First our technician** performs a high resolution air or surface temperature scan of rack inlets. Next we email you the comprehensive ThermalCheckup™ report.

ThermalCheckup™ reports are available for data centers, interior & exterior building surfaces, 3D spatial air temperature and much more.

** ThermalCheckup™ reports can be created from infrared images that you send us!

Rack Inlet Air Temperature Metrics

Object:	AVG:	Range (AVG \pm 3 σ):	SD (σ):	Change:	Potential Savings:
1/Containment 1	23.14°C	21.39 - 24.8°C	0.58 °C	+ 2.1°C	18.93%
2/Containment 2	23.84°C	20.97 - 26.72°C	0.96 °C	+ 0.28°C	2.56%
3/Containment 3	22.41°C	21.65 - 23.18°C	0.25 °C	+ 3.82°C	34.41%

Rack Inlet Air Temperature Distribution

Object:	-3 σ	-2 σ	-1 σ	0 σ	1 σ	2 σ	3 σ
1/Containment 1	21.4-22°C	22-22.6°C	22.6-23.1°C	23.1-23.7°C	23.7-24.3°C	24.3-24.9°C	
2/Containment 2	21-21.9°C	21.9-22.9°C	22.9-23.8°C	23.8-24.8°C	24.8-25.8°C	25.8-26.7°C	
3/Containment 3	21.6-21.9°C	21.9-22.2°C	22.2-22.4°C	22.4-22.7°C	22.7-22.9°C	22.9-23.2°C	

Please contact us for details:

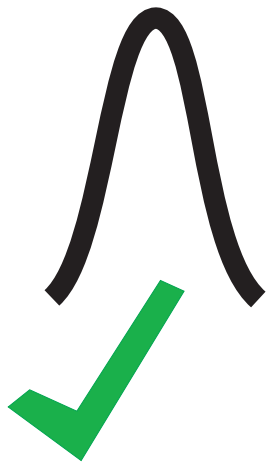
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Avoid Downtime!

A thermally balanced data center (low standard deviation σ) is less susceptible to downtime caused by CRAC failures and hot spots. Standard deviation indicates how spread out temperature measurements are. Low standard deviation indicates that hot and cold air flows are well separated as shown below by the temperature distribution graphs (histograms) of rack inlets:

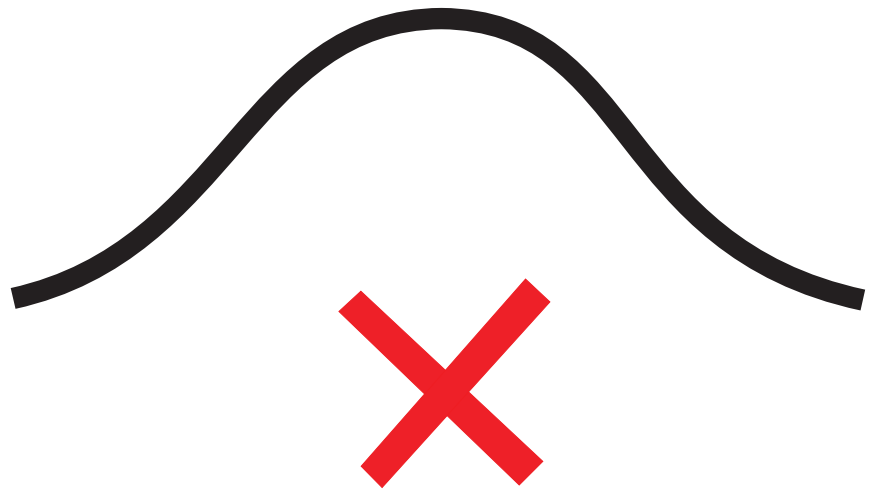
**Low Standard Deviation (σ)
(narrow temperature range)**

Thermally Balanced



**High Standard Deviation (σ)
(wide temperature range)**

Thermally NOT Balanced



Save Energy Costs!

Data centers can save about 9 % in energy costs for each 1 °C increase in server inlet temperature (5% for each 1 °F).

In order to calculate (see image) how much temperature can safely be raised while maintaining a low probability of hot spots, we subtract the highest "probable temperature" from 27 °C (recommended ASHRAE server inlet temperature):

