



VERTIV™

**CRITICAL
INFRASTRUCTURE
ASSESSMENTS**



Vertiv™

Vertiv designs, builds and services mission critical technologies that enable the vital applications for data centers, communication networks, and commercial and industrial environments. We support today's growing mobile and cloud computing markets with our portfolio of power, thermal, infrastructure management products, software and solutions, all complemented by our global service network. Bringing together global reach and local knowledge, and our decades-long heritage including brands like Chloride®, Liebert® and NetSure™, our team of experts is ready to take on your most complex challenges, creating solutions that keep your systems running-and your business moving. Together, we're building the future of a world where critical technologies always work.

YOUR VISION, OUR PASSION.

Vertiv.com



Critical Infrastructure Assessments

Professional insight delivered by Vertiv™ experts will ensure that your infrastructure performs at its best today and in the future.

Vertiv's professional Critical Infrastructure Assessments are designed to provide facility managers with insight into the performance of their infrastructure. The assessments furthermore assist in identifying areas of optimization in availability and efficiency. In doing so, industry best practice parameters are used to measure and evaluate data center operation and performance.

The assessments specifically evaluate the extent to which cooling and power

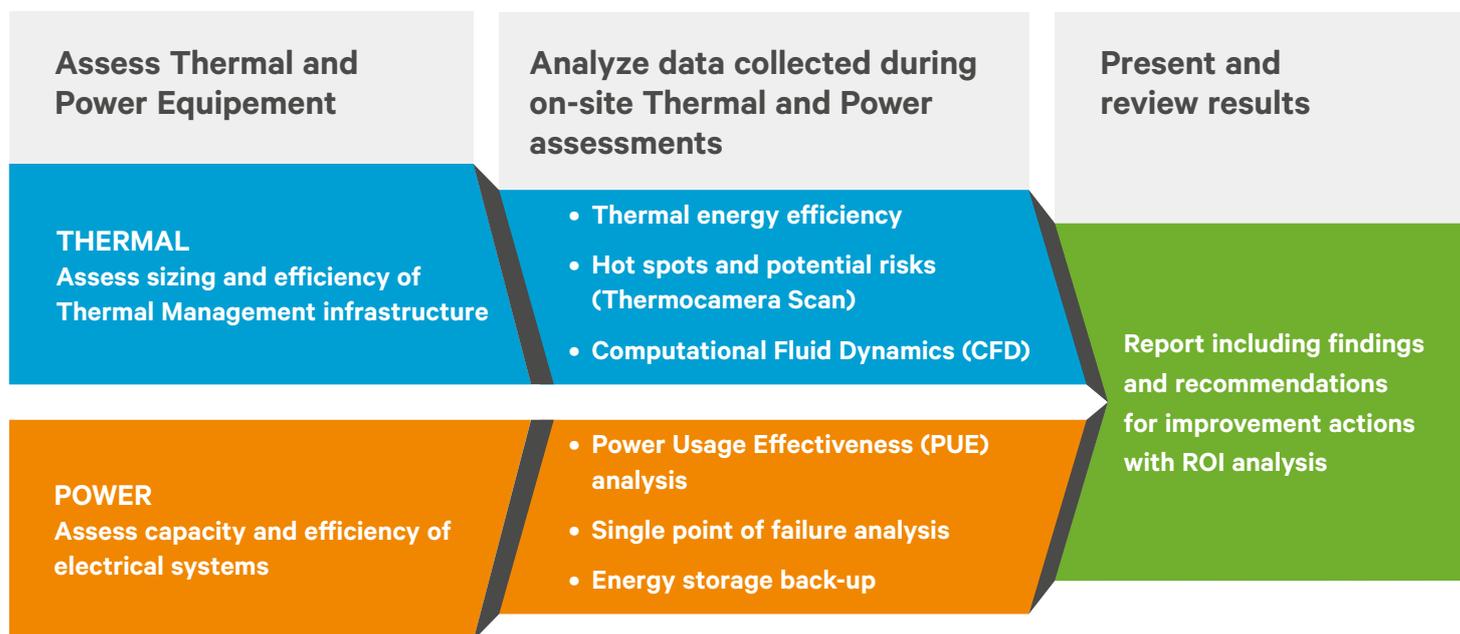
architecture is leveraged, the level of redundancy, as well as the efficiency of the installed systems, presence of hot spots, the use of floor space and air distribution versus heat dissipation.

Utilizing industry-leading assessment tools to deliver superior analysis allows our expert Customer Engineers to verify that equipment is correctly dimensioned for the current demands. It also enables them to provide advice on how and where the critical infrastructure can be strengthened to meet future demands.

The comprehensive assessment report details recommendations for optimizing the performance, capacity, availability and efficiency of both cooling and power equipment. Assessment reports are backed up by financial return on investment (ROI) calculations.

Computational Fluid Dynamics (CFD) modeling is an optional additional deliverable supporting scenario evaluations.

Maximize efficiency and uptime in data centers and telecom sites in order to reduce TCO and optimize performance



Audit

Vertiv's Critical Infrastructure Audit provides a qualitative snapshot of the overall health of the infrastructure, evaluating its operation based on industry benchmarks.

Providing insight into the current status of the infrastructure operation, the audit also serves as a means of evaluating if a more in depth analysis, such as a Critical

Infrastructure Assessment or specific Power or Thermal Management Assessment is warranted.

During Audits Vertiv experts carry out site visits to evaluate the health status of the customer site to identify improvement possibilities, steps for greater flexibility, reliability and total cost of ownership (TCO) optimization.

The remote data analysis relates to:

- Power and Cooling
- Racks and Cabling
- Monitoring Systems
- Service Practices.

The result is a report including recommendations for optimized site operation, capacity utilization, efficiency and availability.

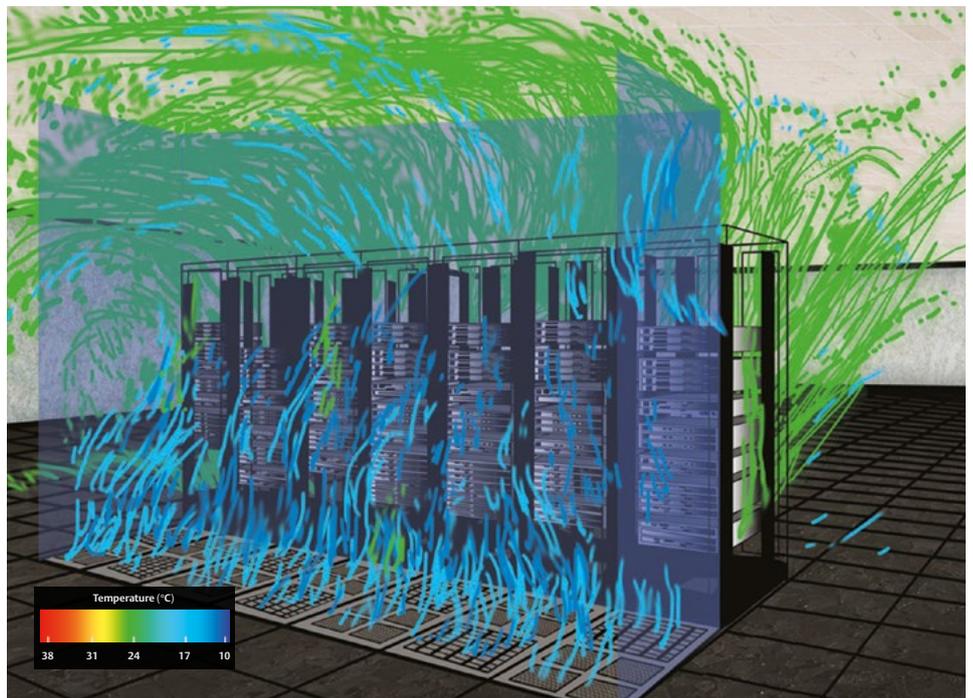
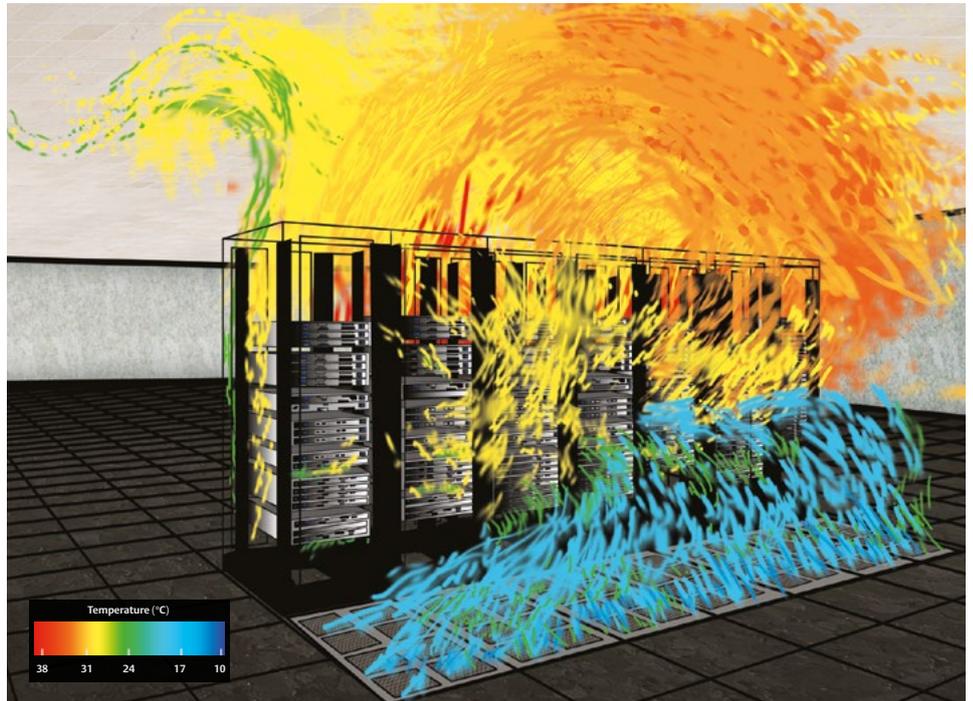
Thermal Management Assessments

Specific Thermal Management Assessments enhance system availability by identifying and eliminating hot spots, as well as providing vital recommendations for maximizing the performance and efficiency of thermal management infrastructure, in addition to system expansion and optimization.

Using industry-leading tools, Vertiv experts assess the thermal management infrastructure, to recommend actions for both optimal cooling utilization and site reliability, and energy consumption and operating cost savings. Compliance with industry best practices and safety codes and standards is ensured.

Vertiv™ comprehensive Thermal Management Assessments feature:

- Air Temperature measurement
- Air Flow measurement
- Identification of hot spots through tools such as thermo cameras and Computational Fluid Dynamics (CFD) modeling
- Comparison of IT /Telecom equipment load with cooling unit capacity
- Computational Fluid Dynamics (CFD) modeling.



Computational Fluid Dynamics (CFD) modeling visually depicts the heat-related impact on data center facilities by simulating the outcome following the implementation of recommendations.

Critical Power Assessment

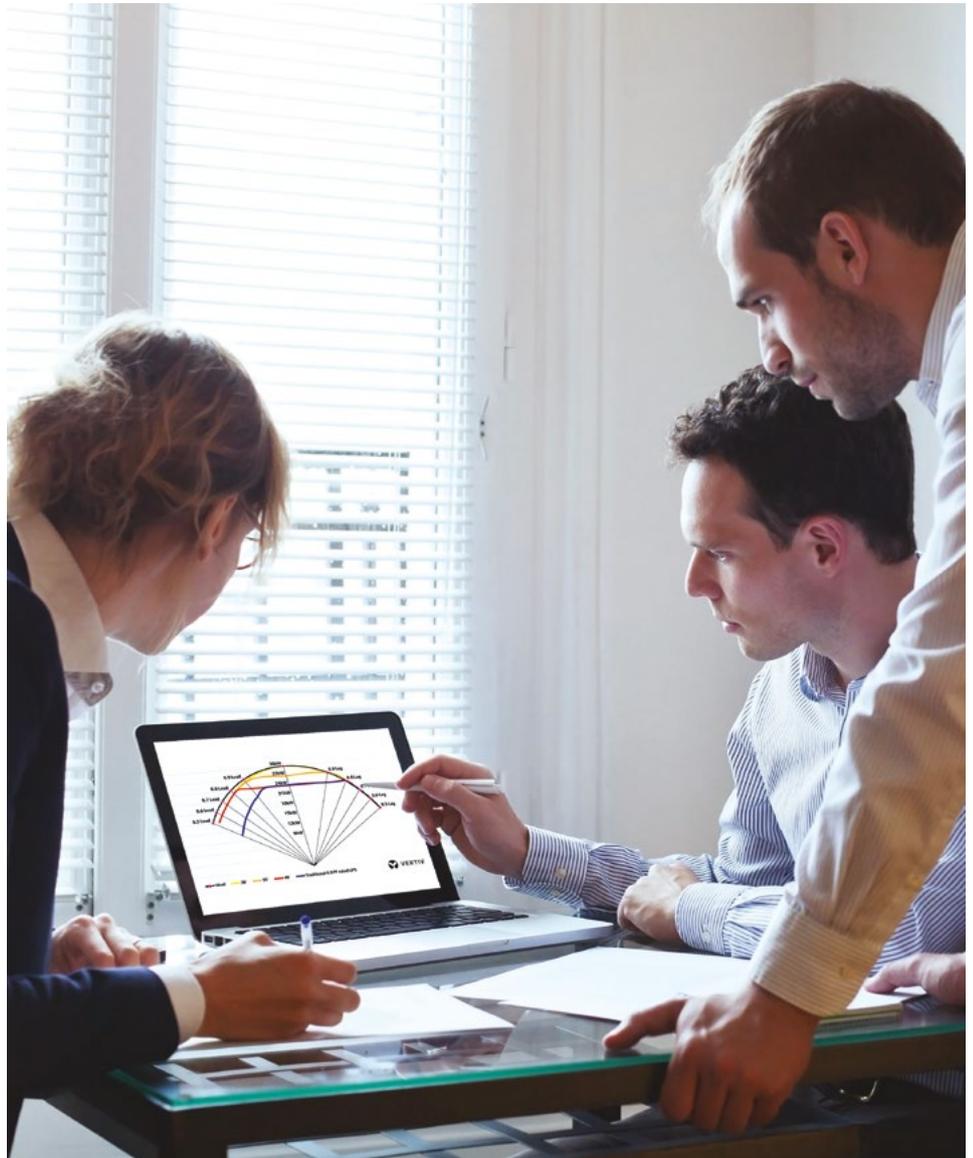
A dedicated Power Assessment will determine the power equipment performance, as well as identify energy saving opportunities at site, ensuring overall infrastructure availability.

Using industry-leading tools, assess the electrical infrastructure from the incoming power through to the critical load, with the objective of recommending actions for improving power-related performance, energy and other operating cost-savings while ensuring compliance with industry best practices and safety codes and standards.

Industry benchmarks and best practices are used as parameters for evaluation.

Vertiv™ comprehensive power assessment features:

- Power Usage Effectiveness (PUE) analysis
- Single point of failure analysis
- Switchgear equipment analysis
- DC system analysis including rated capacity, utilization and efficiency on rectifiers and inverters
- UPS system analysis including rated capacity, utilization and efficiency
- Battery backup and battery optimization
- Critical components thermal analysis.



How Vertiv™ Makes it Possible

Vertiv supports critical infrastructures with an extensive service offering throughout their entire lifecycle, enhancing network availability and ensuring continuity and uptime 24/7.

With the broadest, most comprehensive service presence in the industry, and more than 600 Customer Engineers dedicated to servicing Europe, Middle East and Africa, Vertiv ensures that your business is protected 100% of the time, with assistance close by whenever needed.

Vertiv Customer Engineers are experienced professionals who regularly undergo intensive training programs, certified according to country-specific, European and international regulations and standards.

The aim of Critical Infrastructure Assessment is to maximize efficiency and uptime in data centers and telecom sites, as well as to optimize the performance of power and cooling equipment.

Site assessment is the first step in the optimization journey through which Vertiv accompanies the customer: from initial analysis via small optimization interventions up to complete site renovation and transformation, if needed.

Vertiv stays close to customers during every step necessary to manage and perform the required changes, offering them the ability to choose between

different financial models so that they may select the most attractive to them.

Reducing CapEx expenditure on fixed infrastructure assets and lowering OpEx expenditure through energy savings can be explored before starting this journey.

In fact, Vertiv sustains the Optimization and Transformation of Critical Infrastructure owning all necessary aspects to grant proved improvements and fast payback through Assured Savings.

Vertiv offers Services for optimizing performance, capacity, availability and efficiency, sharing investment and savings, tailoring solutions to customer requirements.



Data centre success stories



Nothern Europe



Central Europe



Southern Europe



CUSTOMER NEEDS

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|--|--|--|
| <ul style="list-style-type: none"> • Increase the efficiency of the cooling system • Reduce carbon footprint • Identify the energy saving opportunities with < 3 years ROI | <ul style="list-style-type: none"> • Increase the efficiency of the cooling system • Reduce carbon footprint • Identify the energy saving opportunities | <ul style="list-style-type: none"> • Increase the efficiency of the system • Reduce carbon footprint • Identify the energy saving opportunities with < 5 years ROI |
|--|--|--|



IMPROVEMENT ACTIONS

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|---|---|---|
| <ul style="list-style-type: none"> • Improve airflow management with Cold Aisle Containment • Replace old direct expansion units with new downflow cooling ones, capable of direct and indirect freecooling • Implement team work and SmartAisle controls for the new cooling infrastructure, further increasing system efficiency | <ul style="list-style-type: none"> • Improve airflow management with Cold Aisle Containment • Replace old direct expansion units with new downflow downflow chilled water ones • Make use of the adiabatic chiller capable of indirect freecooling which reduces energy consumption • Implement team work and SmartAisle™ controls for the new cooling infrastructure, further increasing system efficiency | <ul style="list-style-type: none"> • Optimize airflow management by concentrating cold air where thermal load is, and increase set point of CRAC units • Install direct freecooling unit • Replace AC and DC power systems with new, more efficient ones |
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SITE PERFORMANCE OPTIMIZATION

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|---|---|---|
| <ul style="list-style-type: none"> • Higher efficiency of cooling system via: <ul style="list-style-type: none"> • 2 x Cold Aisle Containments • 10 x Liebert PDX cooling units | <ul style="list-style-type: none"> • Higher efficiency of cooling system via: <ul style="list-style-type: none"> • 1 x Cold Aisle Containments • 1 x adiabatic Chiller • 3 x Liebert CRV cooling units | <ul style="list-style-type: none"> • Higher efficiency of the entire system via: <ul style="list-style-type: none"> • Optimized airflow management system • 1 x direct freecooling system • 3 x Liebert CRV units • 1 x Liebert EXS UPS system • 1 x Netsure DC power system |
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TCO REDUCTION

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|---|--|---|
| <ul style="list-style-type: none"> • ROI < 3 years • Energy savings > 1.200.000 kWh/year (£ 140.000/year) • 50% reduction of cooling system energy consumption | <ul style="list-style-type: none"> • ROI < 4 years • Energy savings > 1.000.000 kWh/year (€ 90.000/year) • 75% reduction of cooling system energy consumption • Adiabatic chiller managing all heat load with freecooling for about 4.100 hours a year • This solution has taken yearly EER from 206 to 739 | <ul style="list-style-type: none"> • ROI < 2 years • Energy savings > 160.000 kWh/year (€ 24.000/year) • 20% reduction of total energy consumption |
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