

### THE FOUNDATION OF DATA CENTER UPTIME: RELIABILITY AND EXPECTATIONS

The data center industry's goal for uptime is 99.999% which only equates to 5.25 minutes of downtime per year.

A stable local power grid, supported by backup generators, is ideal for ensuring uninterrupted standby operation. However, this scenario is not always the reality.

To achieve high uptime, it's essential to implement redundant systems, backup power sources, cooling systems, and other critical infrastructure components. This minimizes outage risks. Furthermore, many data centers utilize monitoring and management tools to promptly identify and resolve potential problems, preventing downtime.

Downtime not only leads to substantial financial losses but also damages the reputation of businesses dependent on data center services.

**Statistics show downtime in a data center could cost \$140k to \$540k per hour depending on the organization.**

### PROBLEM: HEAT GENERATION IN A TYPICAL DATACENTER

Heat generation in a data center is a significant concern due to the large number of electronic components working together to process and store data. The primary sources of heat generation in a typical data center include:

**Server Racks:** The most substantial heat generation comes from the server racks hosting numerous servers. Servers consist of processors, memory modules, storage devices, and other components that consume electrical power during operation. The inefficiencies in converting electrical power to computational work result in heat being produced.

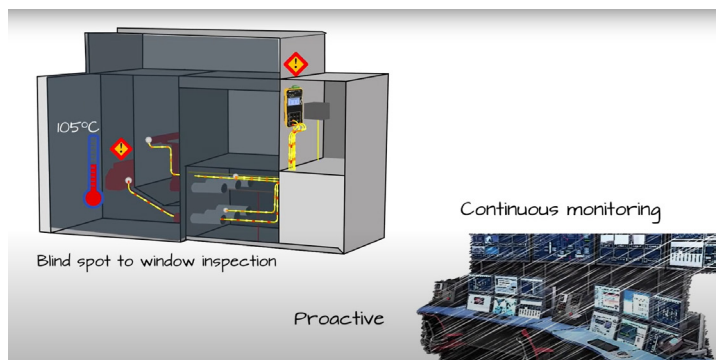
**Networking Equipment:** Networking devices, such as routers and switches, contribute to heat generation as they manage the flow of data within the data center. These devices have their own processors and electronic components that consume power and produce heat.

**Storage Systems:** Storage devices, including hard disk drives (HDDs) and solid-state drives (SSDs), generate heat during read and write operations. The more intensive the data storage activities, the higher the heat produced.

**Power Distribution Units (PDUs) and Uninterruptible Power Supplies (UPS):** These components play a crucial role in managing and distributing power within the data center. While they are essential for maintaining a stable power supply, they also contribute to heat generation as they convert and distribute electrical power.

**Cooling Systems:** Ironically, the systems designed to dissipate heat also contribute to the overall heat load in a data center. Air conditioning units and cooling systems work tirelessly to maintain an optimal operating temperature, but they themselves consume electrical power and generate heat.

**Lighting and Miscellaneous Equipment:** Other equipment, such as lighting systems, monitoring devices, and control systems, also contribute to the overall heat load in a data center. Efficient heat management is critical in data centers to prevent equipment overheating, which can lead to system failures and reduced operational lifespan.



### SOLUTION: CONTINUOUS THERMAL MONITORING OF ELECTRICAL ASSETS

Infrared thermography to obtain temperature data of electrical assets in data centers presents several challenges due to the complex and dynamic nature of the data center environment. Data centers house a variety of equipment with different heat loads. For example, servers, networking devices, and storage systems may have varying temperature profiles making it challenging to identify and address specific hotspots or cooling issues accurately.

By continuously monitoring temperatures, maintenance teams can identify potential problems before they cause operational disruptions. This helps in implementing preventive maintenance strategies, reducing downtime, and extending the lifespan of critical assets.

Deploying a continuous thermal monitoring solution allows for a vast amount of visibility in areas within the electrical equipment unattainable by thermography. This proactive, data-driven approach allows for timely intervention before issues escalate, reducing the risk of equipment damage or failure, and leads to reduced operational costs over time.

Continuous monitoring of thermal conditions enables data centers to significantly improve the resilience of their infrastructure. Understanding the thermal behavior of these critical systems aids in more effective contingency and emergency planning, meeting the stringent demands for industry uptime.