# Remote Data Center Management:

## Metering, Monitoring, & Management in the New Normal

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# Table of Contents

# Introduction

**The COVID-19 pandemic ushered in a "new normal," and data center professionals must adapt to keep up with the issues of today while maintaining uptime and business continuity. New challenges include an increased demand on infrastructure with a higher potential for outages, more time pressure on projects, and less staff onsite resulting in a more difficult environment for collaboration, planning new infrastructure and services, and performing changes and maintenance. Data center managers must develop a comprehensive remote data center management strategy to find success.**

But how do you know what to do, what tools you need, and what you need to monitor in order to navigate the unique challenges of having to manage your entire data center, colocation, and edge deployment remotely with minimal onsite personnel?

We have had countless conversations with many hundreds of customers in our global user groups for our Data Center Infrastructure Management (DCIM) solution, and we consolidated their feedback on how they are remotely managing their data centers. They have reported that, with the right tools and strategy in place, it is easy to see and understand exactly what is happening in the data center and enable data-driven decision-making.

If you follow best practices and implement a remote data center management strategy, you will improve uptime, increase data center health and efficiency, and boost productivity.

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# Key Issues Driving the Need for a Remote Management Strategy in the New Normal

### Increased work from home and requirements to minimize onsite staff.

Social distancing and restrictions on how many staff members can be onsite are now commonplace. With data center access being extremely limited, management of the data center must be done remotely.

### Increased need for clear instructions for smart hands.

Remote planning and initiation of clear work orders and instructions for remote hands is more important than ever. Data center managers must ensure work activity is done accurately the first time, reducing the need for additional trips to the data center and mitigating the number one cause of downtime: human error.

### Increased complexity and distribution of data centers.

Colocation and edge deployments are on the rise, driving more assets and sites to remote locations. Data center managers need to manage the assets, connections, power, and environment across many locations without the ability to go onsite.

### Increased need for tools to provide automation, data sharing, and collaboration.

To improve productivity and efficiency, data center teams working remotely must break down organizational domains and share a single source of truth via common views of dashboards and reports that are updated and visible in real-time.

# Power Metering with Intelligent Rack PDUs

**At the core of your remote data center management strategy are the power meters that provide critical data and insight into the utilization of your power distribution infrastructure to help ensure safe, efficient, and reliable operations. Intelligent rack power distribution units (PDUs) are networked power strips that distribute power within cabinets to IT equipment. Beyond power metering, intelligent rack PDUs can offer other functionality in comparison to their basic counterparts, such as remote power control, environmental sensors, firmware updates, SNMP trap notifications, and electronic cabinet door locks.**

### There are several types of metering options with intelligent PDUs:

- **Inlet metered.** Metering at the PDU inlet level helps determine power usage and available capacity at the rack, making it easier to provision new equipment, avoid overloading circuits, and calculate Power Usage Effectiveness (PUE).
- **Outlet metered.** Like inlet metering, metering at the PDU outlet level helps determine power usage and available capacity at the rack. Plus, you can understand power consumption down to the device level to identify ghost servers and power hogs, accurately allocate costs to internal or external customers, and compare IT efficiencies.
- **Circuit breaker metered.** Metering at the circuit breaker allows you to know when a circuit breaker is about to trip warning you so you can remediate and maintain uptime.
- **Outlet control.** A switched PDU enables remote power control so you can remotely power on, power off, and power cycle outlets across multiple PDUs from any location.

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# Other Power Meter Options and Locations

**Metering and monitoring up the power chain from individual outlets on intelligent PDUs in the cabinet all the way to the main power source enables you to increase uptime, improve capacity planning and management of existing utilization, report on PUE, reduce energy consumption and costs, and more.**

**Other power meter options include:**

- **Bus drops and busway end feeds.** Overhead power distribution systems can offer flexibility and ease of use. Depending on the model of your busway system, power meters may be at the bus drop above a rack or at the end feed of a row. Tap box meters measure the load at the outlet and end feed meters measure the load at the inlet of the end feed.
- **Remote power panels (RPPs).** RPPs distribute safe and reliable power from floor PDUs or other power sources directly to server cabinets.
- **Floor PDU.** Floor PDUs are large, floor-mounted units that transform and distribute raw power feeds into lower capacity power feeds.
- **Uninterruptible power supply (UPS).** A UPS is a battery backup that ensures no power interruption occurs when there is a utility power failure.
- **Building meters.** Utility meters provide a measurement of the total facility power usage.

# What Power Data Should Be Monitored

**Power meters can provide a wide range of data in different units of measurement. There are several key measurements you should monitor from your power meters to fully understand your data center's power requirements and utilization.**

- **Amps (A).** Amperage is a measure of how fast an electrical current flows. Devices have a rating based on the number of amps they can support. A higher amp rating on a device indicates that it can utilize more power before being overloaded.
- **Volts (V).** Voltage is a measure of electromotive force. One volt causes a current of one amp to flow through a conductor. Higher voltage allows more power to travel through a circuit.
- **Watts (W).** Wattage is a measure of the real power available in an electrical circuit and is often measured in kilowatts (kW) or megawatts (MW). An average server cabinet may require around 7kW while high power density racks may consume much more.
- **Kilovolt Amps (kVA).** kVA is a measure of the apparent power, or total power flowing, in an electrical circuit and is measured as the product of voltage and current.
- **Kilowatt Hours (kWh).** kWh is a measure of total energy consumption and is the standard in data center power usage and billing. 1 kWh is the amount of energy used if a 1 kW device ran for an hour.


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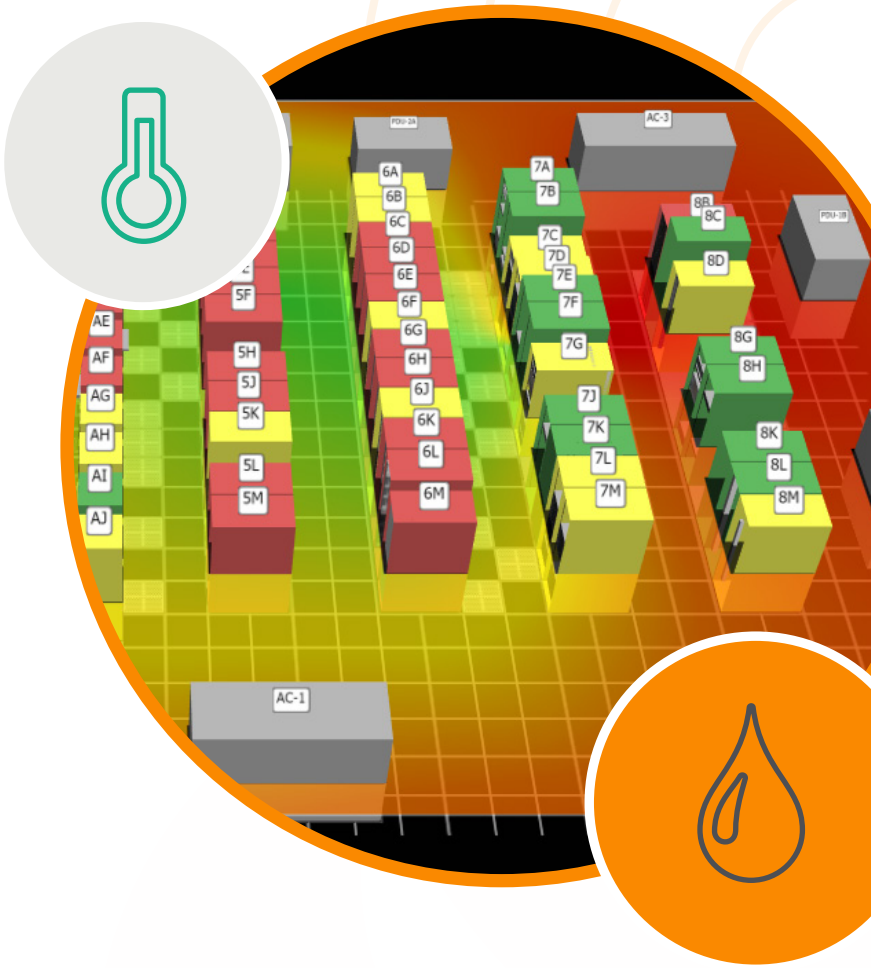
# Environmental Monitoring Options and Locations

**In addition to power monitoring, environmental monitoring is necessary to ensure the overall health of your data center, mitigate against threats of downtime, and improve efficiency.**

**The most commonly deployed environment sensors are:**

- **Temperature.** Monitor the temperature in your environment to identify the formation of hot spots that can damage equipment and cause downtime or know if you are overcooling the data center and overspending on energy. Some make the mistake of only monitoring the temperature at the room level, while the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) recommends placing no fewer than six temperature sensors in each rack, mounted at the top, middle, and bottom of both the front and back of the rack. The recommended temperature range at the intake is between 18°-27°C / 65°-80°F and the exhaust temperature should be no less than 20°C / 35°F compared to the intake.

- **Humidity.** When the environment is too dry, static electricity can build up. Too humid, and equipment can corrode. Since extreme humidity levels either way can damage equipment and cause downtime, monitor for humidity and maintain a stable environment. ASHRAE recommends that the relative humidity in the data center should be between 40% and 60%. Since humidity does not vary as quickly as temperature, fewer sensors are needed. Typically, one humidity sensor is deployed for every five racks and placed in the front of a rack, but more can be used for extra coverage.

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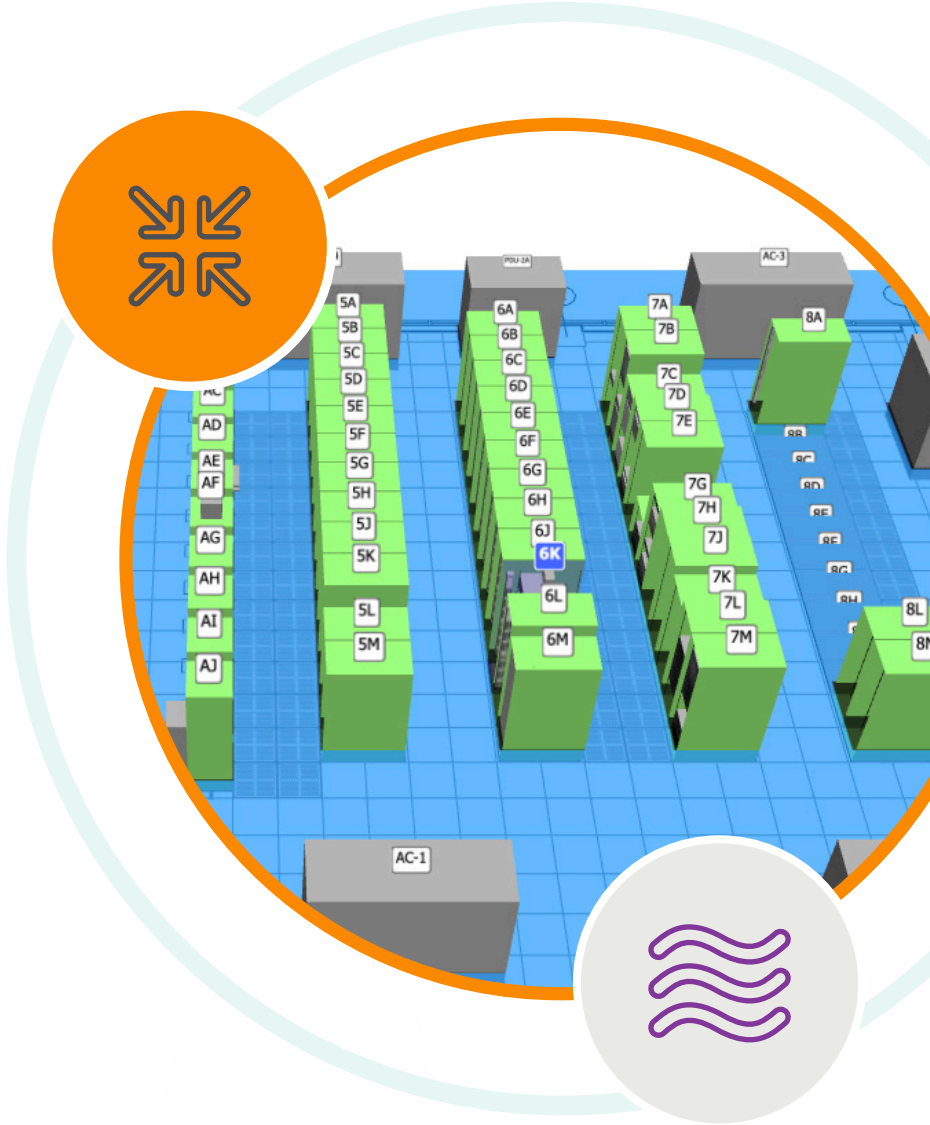
# Environmental Monitoring Options and Locations (continued)

- **Airflow.** Proper airflow in a data center will help avoid hot spots and maintain a stable ambient temperature, but cabling and other obstructions can build up over time and disrupt airflow. Monitor airflow to ensure cold air is efficiently cooling the environment and to understand if you need to make adjustments. It is recommended to place one airflow sensor at each cold air supply and one at each hot air return.

- **Pressure.** For hot aisle/cold aisle deployments using variable speed fans, the difference in airflow between the aisles can potentially cause certain partitions like plastic curtains to be draw into an aisle creating an air leak that can lead to inefficient cooling and hot spots. Similarly, a chimney above a high heat, high air pressure rack may leak hot air into a neighboring chimney above a low heat, low air pressure rack. Differential air pressure sensors are typically placed at the top and bottom of racks, between aisles, between underfloor perforated titles, and in vents and air plenums.

- **Connectivity options.** Environmental sensors can be deployed as plug-and-play devices that connect to intelligent rack PDUs, rack controllers, inline meters, branch circuit monitors, and gateway devices. From there, the sensor data can be collected, analyzed, and reported on by your data center management software. Sensor connectivity can be either wired or wireless. Wired systems are typically fast, reliable, and unimpeded by electronic interference or distance, but are expensive and time-consuming to install and are vulnerable to damage and loosened or disconnected wires. Wireless systems are cost-effective, can be placed throughout the facility with no cabling required, and are easily scalable, but may be affected by interference or long distances between sensors.

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# Other Sensors and Intelligent Equipment to Consider

**For the most complete and robust remote data center management strategy, there are other sensors and devices you should consider. When you are not onsite, you may not have full visibility into what is happening in the data center. These additional sensors and intelligent equipment fill the gaps so you can see, know, and remotely manage everything in your data center.**

- **Vibration.** Vibrations in the data center can potentially damage disk drives over time and cause downtime. When vibration sensor data is charted over time in DCIM software with a Parts Management feature, makes and models of disk drives that have a higher probability of failure can easily be identified in every piece of equipment across an organization's entire global infrastructure.

- **Water.** Early detection of water in the data center can give you enough time to prevent a potential disaster. Consider deploying water sensors to avoid downtime caused by undetected air conditioning leakage, condensation, burst pipes, or local plumbing failures.

- **Contact closure.** Keep your data center secure with contact closures to know if your cabinet doors are open or closed. Often, contact closures are connected to third-party sensors, such as a smoke detection sensor or a webcam that takes a picture when a cabinet door is opened.

- **Cabinet door locks.** Keep your cabinets secure with door locks that restrict unauthorized user access by RFID card or biometrics. Electronic door locks can be remotely locked and unlocked to restrict physical access to individual cabinets or areas of the data center and can provide an audit report to understand who accessed what and when.

- **Cameras.** Real-time camera feeds from closed-circuit television (CCTV) cameras let you view and protect your data centers anytime, anywhere.

# Data Center Management Software and Remote Management Best Practices

**Data center professionals now need to leverage a wide range of technologies in their remote data center management toolkit such as intelligent PDUs, KVM over IP switches, serial console servers, power meters, environmental sensors, electronic door locks, and a building management systems (BMS). But to complete the remote data center management toolkit and bridge information across organizational domains, all data center managers must have Data Center Infrastructure Management (DCIM) software.**

**DCIM software enables data center managers to centrally manage all their resources and capacities in a single pane of glass to maintain uptime, improve efficiency of capacity utilization, and increase the productivity of people.**

**Follow best practices and leverage DCIM software to:**

- **Trend temperature and humidity.** DCIM software collects all the real-time data from your environmental sensors, retains that data for long periods of time, and transforms it into actionable information in the form of easy-to-use, flexible charting and visual reporting capabilities. Easily identify hot spots, overcooling, or extreme humidity conditions to improve uptime and reduce energy costs.

- **Monitor rack-level power utilization.** Data center power resources are increasingly constrained, while managing to uptime competes with driving efficient power utilization. Monitor your power utilization to improve uptime by ensuring you do not exceed power capacity and save money by discovering and eliminating stranded capacity.

- **Perform rack-level failover scenarios.** Cabinets in modern data centers are densely packed with power-hungry hardware and data center managers are under pressure to deliver increasing amounts of power to these devices. DCIM software enables you to track your power failover redundancy for each cabinet to ensure that power is always available to IT equipment to minimize downtime.

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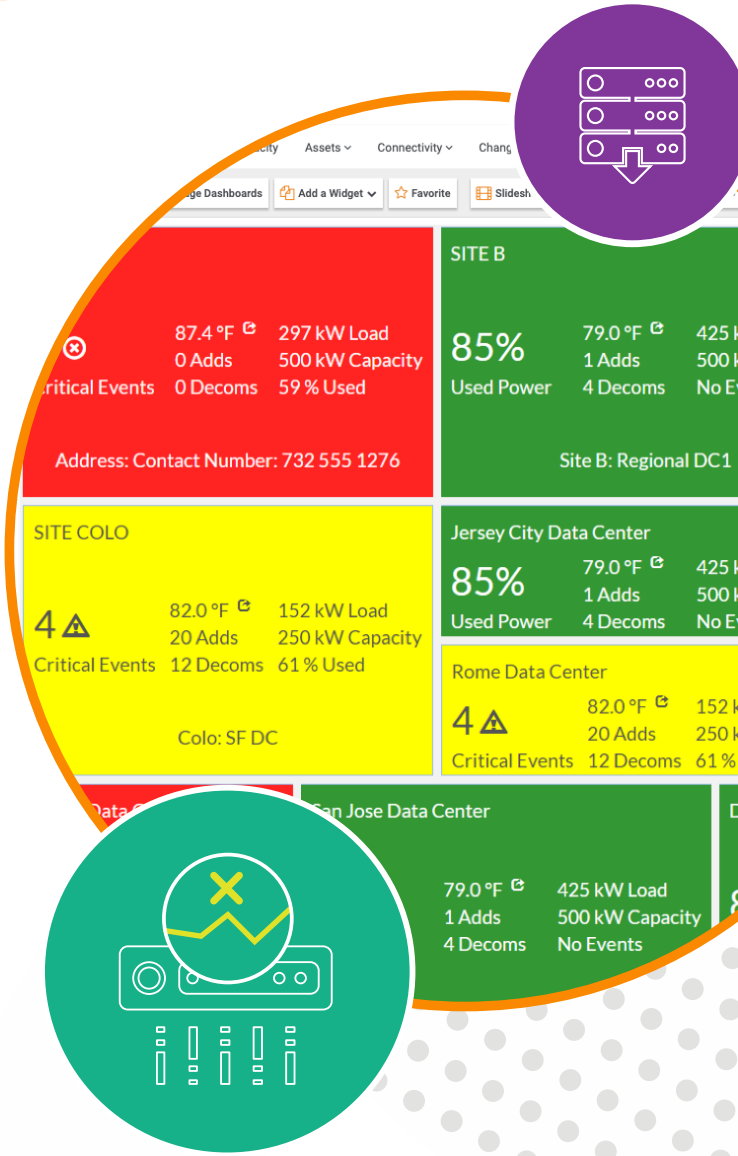
# Data Center Management Software and Remote Management Best Practices (continued)

- **Perform power path impact analysis.** Model your power path with live data from power meters to easily understand how potential moves, adds, and changes will impact your power utilization and capacity. Know that the work being done in the data center will not overload circuits and cause downtime.
- **Balance three-phase power.** Power balanced on all three phases delivers energy more efficiently from the source. Unbalanced power can lead to downtime from premature circuit breaker trips and to high voltages which reduces the useful life of equipment. DCIM software automatically calculates percent imbalance and alerts you of any imbalance in your power path based on thresholds you set.
- **Monitor warning and critical events.** Improve the health and efficiency of your data center by properly configuring thresholds on polled power and environmental sensor data and received automatic emails of warning and critical events such as overloaded circuits, extreme temperature or humidity, or three-phase deviations.
- **Manage all spares for break/fix.** A modern DCIM solution will enable you to track all your hard drives, cards, memory modules, power supplies, patch cables, and any other component, even boxes of screws. Know the exact count of your in-stock and in-use parts and get automatic emails based on configurable thresholds of when you need to resupply.
- **Manage parts and bills of material (BOM).** When provisioning new equipment for projects in the data center, leverage DCIM software to track all the necessary parts and quickly draft a BOM.

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# Remote Data Center Infrastructure Management Toolkit

- **Remote monitoring software**
  - DCIM
  - BMS
- **Remote operations management software**
  - DCIM
- **Remote power control**
  - Intelligent rack PDUs with outlet control
- **Remote power monitoring**
  - Intelligent rack PDUs with inlet metering/outlet metering
  - Branch circuit metering
  - Busway metering
  - Inline meters
  - SNMP management cards for UPS
- **Remote environmental monitoring**
  - Sensor gateways
  - Sensors: temperature, humidity, pressure, airflow, contact closure
- **Remote security**
  - Cabinet door access audits
  - Remote door lock control
  - Door contacts
  - IP camera
- **Remote out-of-band console management**
  - KVM over IP switches
  - Serial console servers
- **Integration strategy**
  - CMDB, REST APIs, SNMP, BACnet, Modbus

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# Conclusion

**The new normal may present a unique set of challenges, but the objectives remain the same: improve uptime, utilization, and productivity. Implement a comprehensive remote data center management strategy with the proper meters, sensors, and software, and you will be able to ensure the overall health and efficiency across your entire data center deployment.**

# Take the Next Steps with Sunbird

## Request a Personalized Demo

Get a one-on-one live tour of our remote data center management software with a DCIM specialist

**Request Demo Now**

## DCIM Operations Online Demo

Remote 3D visualization of all your racks, assets, power, and network connections. View 100+ dashboard charts and reports. Know the capacity of all infrastructure items.

**Try it Free**

## DCIM Monitoring Online Demo

Remotely monitor rack PDUs, UPSs, branch circuit meters, RPPs, floor PDUs, busways, cameras, door locks, and temperature, humidity, and other sensors. Remote central power control of all servers. Set thresholds, see trends, and get alerts.

**Try it Free**

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