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The Wire-Free Advantage:
Six Leading Benefits of Sensor
Networks in Data Centers

Executive Overview

Too hot. Too cold. Too remote. Too complex. Too costly. The challenges in today's wired data centers are endless. IT professionals must control data center environments, track remote locations, and manage complex and constantly changing equipment and the wires that connect them — all while striving to contain costs.

What's more, the challenges keep building and the pressures keep rising. For example, from compressed server designs to virtualization software to circuit density, hotter devices are placing increased stress on data centers' environmental control. Historically, efforts to monitor and control temperatures that keep equipment safe have been to blast air conditioning into the rooms. But with today's rising energy costs, this safe-gap significantly increases energy expenditures. Dealing with these challenges and others means that IT staffs spend a greater number of hours managing data center environments and monitoring equipment than taking care of other critical business tasks.

With these conditions negatively impacting cost management and IT workforce efficiency, companies face growing pressure to find solutions that lower energy costs, improve operational management, and increase IT staff productivity. As a result, many companies are rethinking how they manage their data centers. One of the most effective ways is to lose the wires — and deploy wire-free sensor networks. This technology offers data centers several significant advantages that boost productivity, improve operational management, and lower costs. This white paper discusses six of the leading advantages of wire-free sensor networks.

The Wire-Free Solution — How Sensor Networks Work

The traditional approach to environmental monitoring and operational management in data centers has been to deploy large, wired monitoring systems across the network. However, these wired systems are typically costly to install and reconfigure, especially as servers, software, circuitry, and other devices are updated, replaced, and repaired.

Sensor technology emerged to give data center environments the ability to centrally monitor networks and improve network management. Sensor networks are deployed to collect and report data through the sensors, which are attached to devices across regions or networks. But the majority of these solutions employ wires to operate. The sensors either require power cables or are physically connected to readers that transmits sensor readings wirelessly.

The next evolution of this technology is a completely wire-free solution that requires no wired connections between the sensors and the readers. Wire-free sensor networks offer a significantly improved alternative that is simpler and less expensive to install and manage, ensures less interference with existing infrastructure, boosts performance capabilities, and is easier to deploy across a network, even to the most remote regions. The combination of a lower cost installation and higher levels of control over the data center environment delivers significant overall cost savings from reduced manpower and energy consumption.

The efficiencies and cost-savings inherent in wire-free sensor networks lay in their simple, but powerful, architecture. Sensor networks consist of three main components: sensors, readers, and software. Sensors are spatially distributed across a network where they gather data. The data is transmitted to the readers without wires. The readers can operate independently or connect to a

host system that collects, processes, analyzes, and presents measurement data to end users via software. Sensor networks can scale from tens to hundreds of sensors.

The applications for sensor networks are many and varied, but typically involve monitoring, tracking, and controlling physical and environmental conditions. Common applications include environmental monitoring (including heat, pressure, sound, and motion), object tracking, process control, building controls, fire detection, human safety, healthcare operations, and physical security.

Each sensor is equipped with the following:

- Processing unit — with some computational power and memory

- Sensors — including specific condition circuitry

- Communication device — usually a radio transmitter

- Power source — such as a battery with wire-free solutions

Sensor sizes vary depending on their capabilities, such as energy, memory, speed, and bandwidth. They can be as large as a shoebox or smaller than a coin. Costs depend on the size and complexity of the sensors, and range from a few cents to hundreds of dollars. Complex configurations may include power alternatives, such as energy-harvesting modules, secondary signal processors, and possibly secondary communication schemes, such as RS-232 or USB.

Sensor readers generally are designed with much more computation, energy, and communication resources. Owing to their more complex capabilities, readers may require both wired power and Ethernet. The number of readers required for each network depends on the communication range of the sensors and the number of sensors that can be simultaneously monitored on a single reader.

Six Ways Wire-Free Sensor Networks Lower Data Center Costs and Improve Productivity

1. Lose the wires and lower your costs.

Running wires from server to server and device to device, and managing those connections is a never-ending, complex challenge. Every time a device is replaced, retired, or repaired it requires significant reconfiguration of the wiring maze. Managing this complexity takes considerable time away from IT staff's other important responsibilities.

Wire-free sensor networks solve this chronic headache by eliminating the wires from the network and replacing them with wire-free sensors, which are deployed via a simple peel-and-stick application. With this simple installation, adding to and changing devices becomes infinitely faster, easier, and more flexible. As a result, IT staff's time is not squandered unplugging and plugging in miles of wires. This lowers costs and frees your IT staff to engage in more vital operational tasks.

2. Control your environment.

Maintaining optimum temperature and humidity around your IT assets is vital. In fact, more property damage is caused by environmental conditions such as water leakage, temperature extremes, humidity, and power failure than by theft or fire. But measuring and monitoring environmental conditions presents enormous challenges to wired data centers. Today's smaller, more condensed, and hotter-running devices compound the difficulty. Further, the architecture of some data centers also complicates IT staff's ability to maintain optimum environmental controls.

Wire-free sensor networks provide real-time environmental monitoring of the temperature, humidity, and moisture impacting your network. In this way, ideal environmental conditions are easily regulated and stabilized. Also, early-warning parameters can be set to send warnings from remote locations when environmental conditions are compromised. Potential problems can be identified and addressed proactively, before they wreak havoc on your network.

3. Reach every corner of your network.

Whether it's in remote locations or small spaces, IT staffs have historically found it difficult and cost-prohibitive to monitor 100 percent of a data center's IT assets. But, like a weak link in a chain, not being able to monitor all of your IT assets creates risk for your entire network's operation and security.

Wire-free sensor networks track sensor tags over large areas, no matter where they are located. In fact, sensor networks provide the additional advantage of extending environmental monitoring into areas that were previously difficult or even impossible to reach. What's more, wire-free sensor networks' monitoring capabilities, including temperature and humidity, pressure, motion, and door status, offer comprehensive monitoring that was only previously available through physically connected measurement systems.

4. Keep cool cost-effectively.

Today's compressed technology designs are heating up data centers. Consider just one device: new blade server designs condense processing power into a smaller space. This offers several advantages and one big disadvantage: These server designs run hotter and require more power. This problem is compounded by many other compressed device designs. All of these hotter devices mean higher energy costs to keep data centers cooler. Typically the solution is to simply run data centers at very cold temperatures. But as energy costs climb annually, data centers are tasked with finding ways to lower energy costs.

Wire-free sensor networks offer a way to achieve greater energy optimization, because they provide the ability to micro-manage temperature and humidity levels precisely in data centers on a region-by-region basis. As a result, they provide the ability to control temperatures precisely across the network, versus just blasting in more cool air everywhere. This greater level of control means greater cost savings. For example, raising rack air intake temperatures by just one degree Fahrenheit can reduce data center power costs by as much as two percent annually. But being able to determine this fine-grained level of environmental management requires the sophisticated monitoring capabilities that wire-free sensor networks provide.

5. Leverage the Internet's ubiquity.

With WiFi capabilities reaching into nearly every corner of the world, monitoring sensor networks has never been easier. With the right software, every control being monitored can be viewed in real-time over the Internet, including parameters such as moisture content, relative humidity, and temperature. This extends vital levels of real-time access and flexibility, and ensures non-stop awareness of locations, assets, and the environment. Up to 1,400 wire-free sensors can be simultaneously monitored by one reader at a transmission range of 150 to 300 feet, depending on building construction material.

6. Boost DCIM capabilities.

Wire-free sensor networks work seamlessly with and boost the capabilities of Data Center Infrastructure Management (DCIM) systems. Sensors feed DCIM systems critical data to improve monitoring and management tasks, such as power and cooling efficiency, and capacity planning based on hardware location and equipment density inside racks. Unlike wired sensor solutions that are complex to deploy, wire-free sensors with peel-and-stick deployment are both easy and cost-effective to install. Not only is the initial installation efficient, but also all future growth and changes are simple to manage. Wire-free sensor can even be transferred from one device to another.

Making the Move to Wire-Free Sensor Networks in Your Data Centers

RF Code provides open, secure wire-free environmental and power monitoring and real-time IT asset tracking solutions that reduce the time and cost of discovering, tracking, and monitoring IT assets and the environments in which they're located. These solutions are easily configured to meet the exact nature of a company's most critical asset challenge.

Used by F100 companies, large governmental agencies, leading healthcare institutions, among others, RF Code's offerings are the market's most affordable, easiest to deploy solutions. They easily integrating into a customer's existing technology infrastructure, enabling data centers, IT, facilities, and building professionals, to cost-effectively leverage the information RF Code captures. Investments in this technology are typically recouped within one year.

Based on award-winning active RFID technology, solutions consist of asset tags and environmental sensors, active readers, and software that manages data tracking and monitoring. Leading strategic technology partners, including IBM, HP, and Microsoft, use RF Code to enhance their own offerings.

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