Best Practices for Data Center Monitoring Using Wireless Sensor Networks

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Overview

In data centers, avoiding downtime is critical. Temperature and humidity fluctuations and hot spots can wreak havoc on server hardware and cause costly outages. Additionally, increased power consumption not only leads to increased operating costs but can be an indication of an impending problem. Good airflow is vitally important and must be monitored to ensure air exchange is handled properly. Flooding or wetness in a data center could be disastrous. Sensicast's breakthrough SensiNet® Wireless Sensor Network can be easily deployed in data centers—providing critical environmental data and alerts, reducing costs, and ensuring server uptime.

This white paper will address the following topics:

- How SensiNet makes monitoring of critical data both easier and more cost effective
- Advantages of SensiNet versus other monitoring systems
- How SensiNet applies to data center monitoring

SensiNet Eases the Monitoring of Critical Environmental Data

Sensicast's SensiNet Wireless Sensor Network provides a robust, highly reliable platform to monitor critical data in environments such as data centers. SensiNet provides many advantages over traditional monitoring systems:

- **Cost Savings**—Traditional monitoring systems typically require the costly process of pulling wire through the facility. SensiNet's wireless architecture eliminates the need for this.
- **Ease of Installation**—SensiNet's breakthrough technology allows for quick and easy installation. SensiNet can typically be installed in a matter of days.
- **Flexibility**—SensiNet Smart Sensors can be located virtually anywhere, allowing you to monitor locations that may have been too costly to monitor in the past. SensiNet can also be easily re-configured and re-located as monitoring needs in the environment change.
- **Data Connectivity**—SensiNet integrates with many in-place software and/or HMI systems through the use of ModBus TCP, OPC, ODBC, web services or FTP/HTTP Post. SensiNet can also integrate with SensiNet Services—an off-site, Internet-based monitoring and alarming system.
- **Reliability**—SensiNet has been shown to have 99.99% data reliability.

SensiNet provides a data conduit to third-party monitoring systems and SensiNet Services through the many protocols supported which are outlined above. Collected data can then be used by these applications for real-time monitoring, trending, report generation, and alarm generation.

SensiNet is the leading wireless sensor networking platform, providing extremely reliable and secure data reporting through our Smart Sensors, Mesh Routers and Gateways. SensiNet is changing the way companies monitor data that is critical to their success.

SensiNet and Data Centers

SensiNet is a natural fit for data center monitoring applications. SensiNet Smart Sensors can be deployed easily in any location. IT equipment today operates at a high power density, causing hot spots to form in each server rack. The heat generated has a major impact on uptime of equipment. Monitoring temperature, humidity and power consumption on individual racks is crucial. Additionally, data centers are typically dynamic environments—floor layout can change regularly as more capacity is added. SensiNet's scalable architecture not only allows for easy re-positioning of monitoring points, but also easy integration of additional monitoring points.

In typical data center applications, integrated Temperature and Humidity (TEHU), RTD Temperature (TEMP), 0-10V (VOLT), 4-20mA Current (CURR), and Contact Closure (CONT) Smart Sensors are
deployed. Mesh Routers are also deployed to form a solid wireless backbone and increase network robustness by providing multiple paths to the Gateway, which is used to collect data and configure the network. Configuration and monitoring of data is achieved through the Gateway’s web interface. These building blocks combine to form a SensiNet Network. An overview of a SensiNet Network can be seen in Figure 1.

Monitoring temperature and humidity can be achieved through use of TEMP and TEHU Smart Sensors. In areas where only temperature data is needed, typically a TEMP Smart Sensor is used in conjunction with a standard RTD probe. This makes it easy to monitor temperature in several places in a server rack or in adjacent server racks. In areas where temperature and humidity readings are needed, TEHU Smart Sensors are used. They are typically deployed around server racks to monitor the temperature and humidity in the area of the racks, and also around the data center to monitor the ambient environment.

Monitoring energy consumption is achieved by using a current transducer or power meter and either a VOLT or CURR Smart Sensor. A current transducer is a device that generates a voltage signal that is proportional to the amount of current running through a power cable. The voltage output of the current transducer is then wired into a VOLT Smart Sensor and the power being used is calculated by the monitoring software application using the collected data. If loop power is available, power meters with a 4-20mA output can be wired to CURR Smart Sensors. In this case the power consumption calculated by the power meter and a proportional 4-20mA output is generated. The value can then be scaled in the monitoring software. Monitoring power is important as increased power use not only causes heating but is an indication that an equipment failure is imminent.

Wetness in the vicinity of the server racks can be monitored with a CONT, VOLT, or CURR Smart Sensor, depending on the type of wetness sensor you choose to use. Wetness sensors that indicate wetness via a dry contact would interface with a CONT Smart Sensor. Similarly, wetness sensors that indicate wetness via a current or voltage signal would interface with their respective Smart Sensors (CURR or VOLT). These values are then fed into the monitoring software.
Airflow can be monitored through the combination of flow meters and CURR Smart Sensors. The flow meter outputs a signal between 4 and 20mA that is proportional to the amount of airflow it detects. The mA signal is then input to the CURR Smart Sensor and can then be scaled to the appropriate value in the monitoring software.

A typical SensiNet deployment monitoring temperature, humidity and power is shown in Figure 2. A combination of TEHU and TEMP Smart Sensors are being used to monitor temperature and humidity, and VOLT smart sensors are deployed with current transducers to monitor power consumption. MESH Routers are deployed at various locations to provide multiple paths back to the Gateway and flexibility should the physical environment change (e.g. server racks being added/moved).

![Figure 2: A SensiNet deployment monitoring Temperature, Humidity, and Power Consumption (using CTs and VOLT Smart Sensors) in a data center](image)

**Summary**

The SensiNet Wireless Sensor Network is ideal for monitoring temperature, humidity, power consumption, airflow and wetness in data centers. SensiNet is a highly reliable, highly secure wireless monitoring system that can be easily deployed through a combination of Smart Sensors, MESH Routers, and Gateways. Quick deployment, cost savings, and modularity are just a few of the advantages SensiNet provides over traditional monitoring systems due to its wireless architecture. SensiNet allows you to quickly and effectively monitor critical data that ensures data centers stay up and running 24 hours a day, 365 days a year.