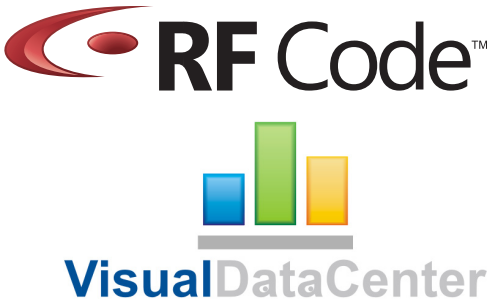

MAXIMIZING YOUR DATA CENTER INFRASTRUCTURE: CENTRALIZED MANAGEMENT AND WIRE-FREE ENVIRONMENTAL MONITORING

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INTRODUCTION

As any data center expert knows, the data center is a constantly evolving, growing and maturing entity. The definition of a world class data center is dramatically different today than it was just five years ago. There are many market trends and technologies that are driving these dramatic changes in the data center. Let's examine a few of the leading trends and technologies and their related effects on the data center.

Virtualization, Cloud Computing, and Server Blades

The combination of virtualization, cloud computing, and server blade technologies continues to increase the density of equipment in the data center. The effect on the data center of these three is higher heat densities. Virtualization and cloud computing tend to increase equipment usage. Higher usage consumes more power and creates more heat. Blade servers enable more equipment to be installed into a single rack, also increasing the heat density. This rise in heat density has to be carefully managed and monitored.

Push to Improve PUE and Efficiency

Increasing data center power efficiency and reducing the data center carbon footprint are now high profile imperatives that are extremely important to corporate executives and share holders. Their effects on the data center can be quite disruptive in the short term but financially beneficial in the long term. In order to successfully implement these types of initiatives, a variety of data center metrics must be monitored, collected and analyzed on a 24x7 basis.

Reduced Personnel Budgets and Staff

The great recession of 2009 and 2010 has left many data centers with less staff and reduced personnel budgets. As a result, the amount of work and responsibility for each data center employee has increased. In many cases, data center employees can no longer engage in proactive tasks, focusing solely on reactively handling issues. All of this drives an even greater need for automation.

Shorter Equipment Lifecycles

The lifecycles of IT equipment in the data center are being reduced by new technologies such as virtualization and server operational efficiency. Replacing existing server equipment is not driven so much by the age of the equipment as by the need for the latest and greatest technology to support new technology and efficiency initiatives. The effect on the data center is an ever-changing environment. New equipment uses data center power, cooling and capacities in different ways than the replaced older equipment. This constant cycle of upgrades and updates requires real-time monitoring and capacity management.

There are many more leading trends and technologies, but these four clearly illustrate the complexity and difficulties facing today's data center managers. Centralized instrumentation, monitoring and automation of the entire data center infrastructure enables data center managers to better adapt and to embrace these leading trends and technologies.

We will now examine how RF Code's wire-free environmental monitoring solution combined with Optimum Path Systems' Visual Data Center provides a centralized monitoring and operations management solution for data center managers.

RF CODE OVERVIEW

RF Code provides an enterprise class, wire-free sensor solution that is ideal for monitoring in real time the environmental conditions in IT dense areas such as data centers and IT closets. RF Code's completely wire-free approach to environmental monitoring is an affordable, flexible alternative to traditional wired environmental monitoring solutions. The solution components consist of:

- R120 Rack Door Tags monitor and report on the open and closed status or doors, enabling you to track enclosure access attempts.
- R130 Dry Contact Tags connect to dry contact devices and continuously monitor and report on the open or closed state of the devices.
- R135 Fluid Sensor Tags are flexible thin-film fluid detection sensors
- R150 Temperature Tags monitor temperature-sensitive assets in IT racks
- The R155 Humidity-Temperature Tag monitors the relative humidity (RH) and ambient temperature surrounding sensitive assets in IT racks

- The M200 Wired Reader interprets and reports the radio frequency messages emitted by RF Code tags at distances up to 1,000 feet and is connected to the Ethernet network
- Zone Manager is RF Code software that collects all of the sensor location and sensor data from the M200 Readers as well as provides management of RF Code tag and reader infrastructure

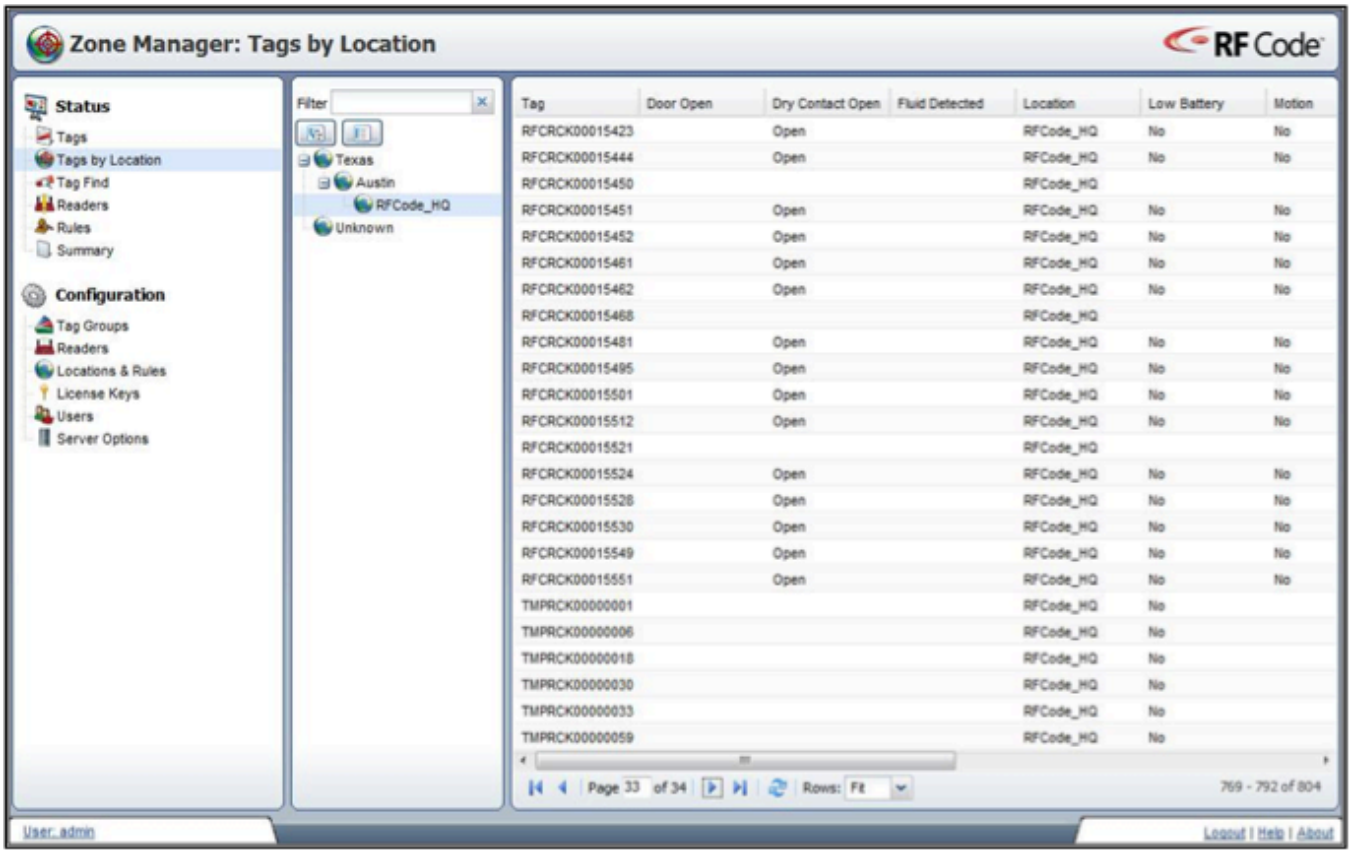
All of the RF Code sensor tags have the following features and characteristics:

- Multiple sensor updates per minute via the RF Code radio frequency network ensure that all environmental conditions are monitored closely
- Small form factor size (2.22 in. X 1.74 in. X 0.35 in. | width X depth X height)
- Multiple mounting options such as adhesive, zip tie lanyard and screw attach plate
- 3 to 5 year battery life (depending upon the sensor type) with field replaceable batteries
- Low cost with tag list prices ranging from $24.95 to $99.95 depending up on the tag sensor type

All of the RF Code sensor tags transmit their data using a patented communications protocol at 433.92 MHz. RF Code sensor tags are not WiFi or Zigbee based, making them smaller in size, easier to deploy and much lower in price than most other wireless sensor solutions. RF Code also has a significant advantage in radio frequency performance. By using the 433.92MHz frequency, the RF Code data transmissions have much better performance around dense metal environments such as racks and servers in a data center. Unlike almost all other wireless sensor solutions, RF Code sensor tags can be placed inside IT racks that are fully enclosed with no need for wires or cables to get the radio transmission electronics outside of the rack.

The RF Code M200 Reader is connected to the Ethernet network and collects all of the radio frequency data transmission from the RF Code sensor tags. A single M200 reader can easily handle 1,400 sensor tags. In an environment where RF Code sensor tags are placed inside fully enclosed IT racks (sides and doors), a single M200 Reader can easily cover 3,000 square feet. In an environment where RF Code sensor tags are deployed on the front and rear of fully open racks (no doors and sides), a single M200 Reader can easily cover 5,000 square feet. Finally, the M200 Reader includes a rules engine that enables it to perform data reduction so it doesn't have to constantly send the same information repeatedly over the Ethernet network. Only changes to tag sensor states and tag sensor data are communicated via the Ethernet network.

Lastly, the RF Code software, Zone Manager, collects all of the data from all M200 Readers in a data center. The Zone Manager software manages all of the TCP/IP connections to the M200 readers, as well as the defined tag groups. The Zone Manager software is highly efficient and scalable enabling a single instance to handle thousands of readers and hundreds of thousands of tags. Zone Manager's open API makes it very easy for other applications to integrate and consume RF Code sensor information. The API enables consuming applications to poll for specific information as well as a subscription interface for receiving all changes and updates.

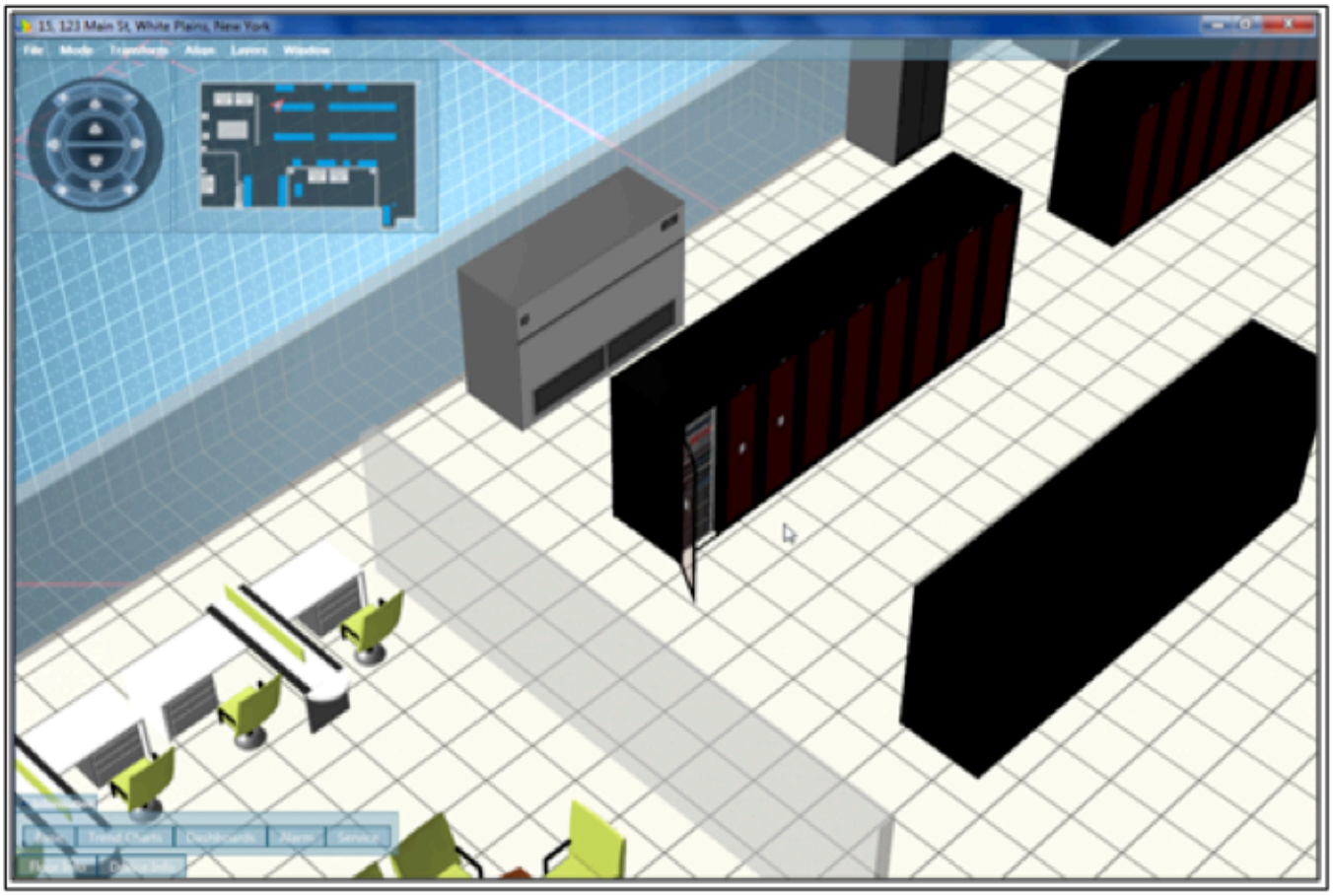


The RF Code wire-free sensor solution is hands down the most cost effective, high performance environmental monitoring solution for enterprise data centers.

VISUAL DATA CENTER OVERVIEW

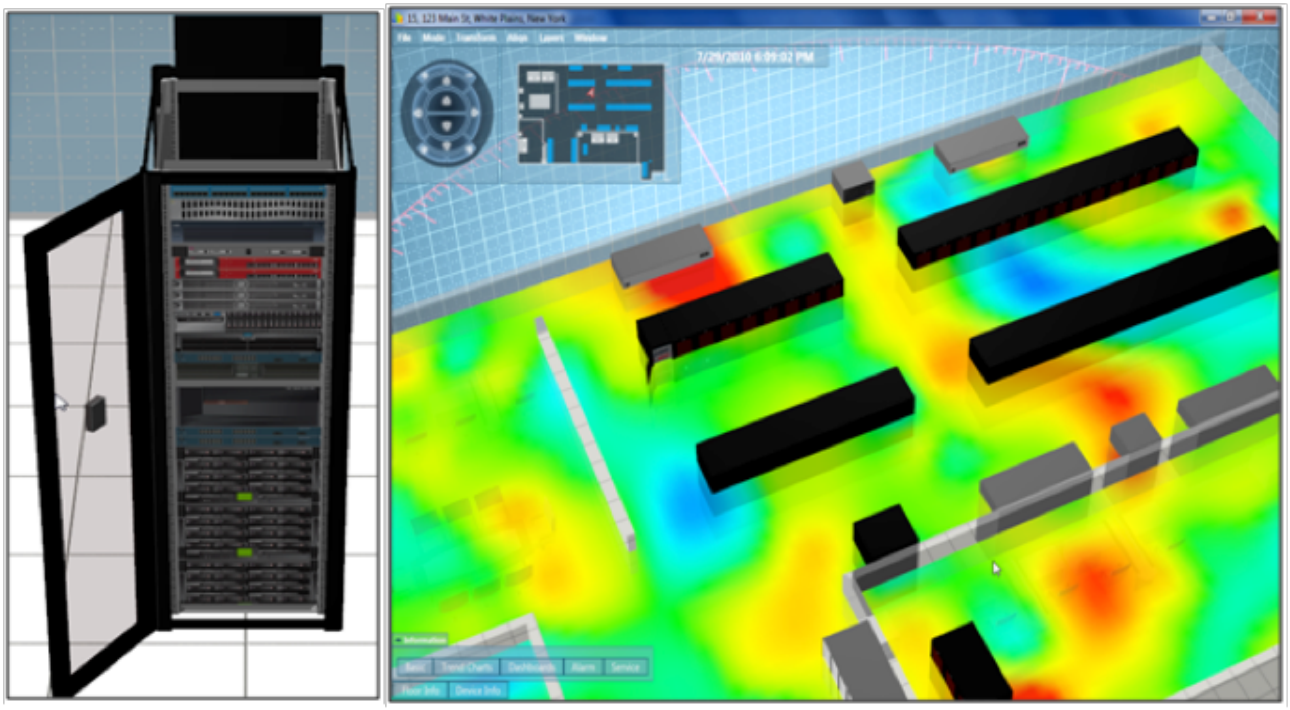
Visual Data Center is an easy-to-use and cost effective centralized data center monitoring and operations management tool. Through the effective use of Visual Data Center, organizations can monitor, visualize, trend, report and manage critical data that can be used to improve data center performance through more efficient operations, reduced energy consumption, better capacity management and more accurate planning.

Visual Data Center provides monitoring and alarming capabilities through standard protocols such as SNMP, Modbus TCP and IPMI. In addition, the system is built on an open plug-in architecture for integration with third party hardware and software applications to support the ability to provide a centralized monitoring and management view. For example, environmental monitoring systems or building management systems (BMS) as well as IP cameras or card access systems can easily be integrated into the portal framework. This feature makes it possible for an organization to gain a consolidated or holistic view of any facility from a single interface.



Within a single floorplan view, monitored data, dashboards and trend charts for a device (UPS, CRAC, PDU, rack, powerstrip, environmental sensor, etc.) can be viewed by simply pointing and clicking on the specific device itself. In addition, through a series of unique data center "Floorplan Layer Views", Visual Data Center displays specific data points from a "facility wide" perspective through a single interface. The available Floorplan Layer Views include (but are not limited to):

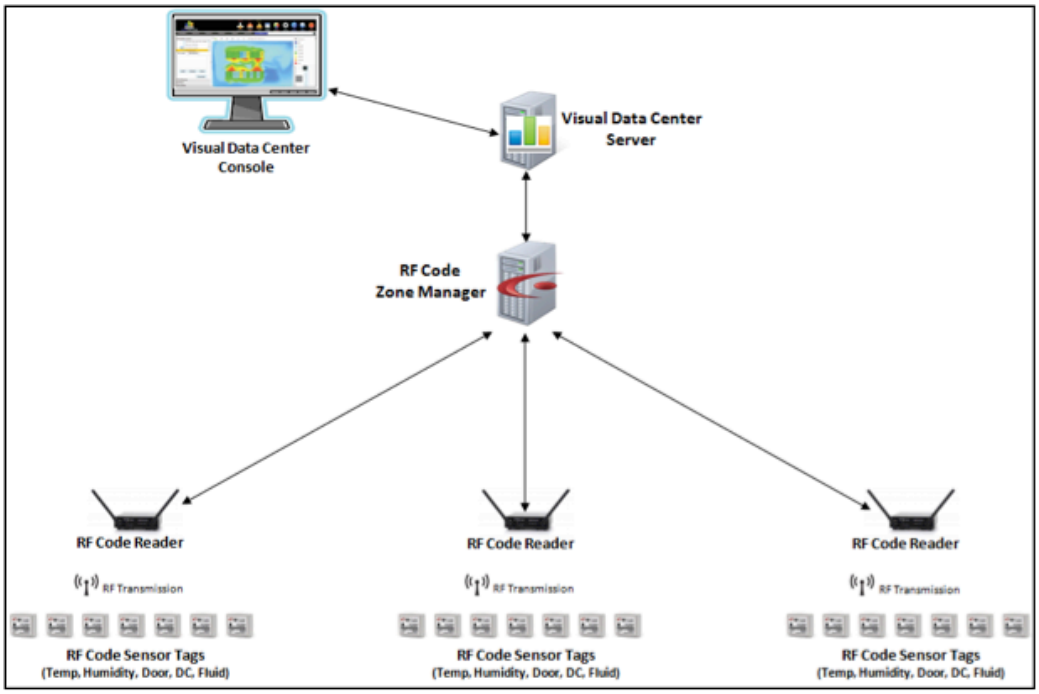
- Alarm/Alert Status – Displays the floor plan showing all active alarm or alert visual indicators.
- Isothermal Image – Displays the isothermal image of the room based on actual temperature readings collected from environmental sensors.
- Temperature Per Rack/Device – Displays the monitored or static temperature in Fahrenheit or Celsius per rack, critical facility device or environmental sensor.
- Humidity Per Rack/Device – Displays the monitored or static humidity reading per rack, critical facility device or sensor.
- Energy Consumption Per Rack/Device – Displays the monitored or static energy consumption in kW or Amps of each rack or critical facility device (PDU, UPS, CRAC, etc.).
- Rack Capacity – Displays total U-space utilized space per rack.
- Maximum Contiguous Rack Space Available – Displays the largest contiguous rack space available within each rack.



Through a combination of native monitoring, integration with 3rd party monitoring applications plus Visual Data Center's design studio, asset management, documentation management, warranty and maintenance management and reporting capabilities, an organization has the ability to use Visual Data Center to maximize the performance and value realized from its critical IT facilities.

INTEGRATION SOLUTION OVERVIEW

The unique integration between Visual Data Center and RF Code's Zone Manager enables all environmental sensor information to be collected, processed and analyzed by Visual Data Center in real-time. The diagram below illustrates the integrated solution architecture.



The integration solution combing Visual Data Center and RF Code provides the following:

- A single holistic view of facility operations and multiple data center layers
- Easily combines environmental data and alarming information into a centralized monitoring system
- Provides a normalized display data from RF Code sensor tags in a highly visual and context sensitive presentation view

SUMMARY AND CONCLUSION

The integrated solution provides outstanding value to data center managers, helping to reduce their overall data center operation costs:

- World-class proactive and predictive real-time monitoring of environmental conditions within the entire data center even down to the rack level.
- Cutting edge wire-free sensor technology allows data centers to fully instrument and achieve complete environmental monitoring that is simpler to deploy and more cost effective than wired solutions.
- The ability to benchmark status, identify areas for improvement, and track the results of improvement efforts.
- The ability to gain easy access to valuable data needed to improve data center effectiveness and efficiency.
- An enterprise ready visualization application that allows for a single centralized holistic view of the multiple layers of the data center.

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Chris C. Gaskins

Chris Gaskins joined RF Code as vice president of product development in 2007. He is an experienced technology development executive with over 20 years in the information technology sector. Mr. Gaskins joined RF Code from American Power Conversion, a leading global provider of high availability systems for network-critical physical infrastructure. At APC, he was responsible for the Security and Environmental Product Line which included product management, product marketing, and engineering. Previously, he served as director of service and support at NetBotz, Inc., a leader in IP-based environmental and video monitoring solutions, where he was responsible for building, leading and managing a worldwide service and support team. Mr. Gaskins was formerly vice president of worldwide development at AppGate Inc., a VPN software company, where he was responsible for building, leading and managing a worldwide software engineering organization with additional responsibilities for customer support and product management. From 1990 until 2002, he served in various engineering, development and product management roles with Tivoli Systems and IBM. Mr. Gaskins earned a B.S. degree in Computer Science from Berry College.

Shawn Griggs

Shawn Griggs was named the Director of Marketing and Product Management for the Visual Data Center product platform in 2009. Prior to joining the Visual Data Center team, he served as the Southeast Regional Channel Manager for APC and Data Center Power and Cooling Product Specialist at McBride Electric & Dataconnect in Atlanta, GA. Mr. Griggs has over ten years experience in designing and providing solutions for power, cooling, and monitoring in the mission critical data center market.