

Integrating Digi Wireless Environmental Monitoring with NetBotz Appliances in Data Center Environments

By Peter Kokolski

Abstract

This document is an overview detailing the further extension of the NetBotz platform to include wireless environmental sensors from *Digi International Inc. (Digi)*. There are configurations where a wired environmental sensor is not a practical solution. This generally occurs where a sensor cable run is too long or the space is too cramped for installation to be accomplished quickly or easily. The primary goal of the NetBotz integration with wireless sensors is to allow rapid deployment and configuration of such devices while harnessing the existing capabilities of the NetBotz appliance and InfraStruxure Central as a management platform.

Introduction

As a general proposition, robustly protecting a data center from physical threats requires three broad concentrations dedicated to that goal: **Environmental**, **Access**, and **Surveillance**. In this application note, only monitoring the data center environment is at issue, which falls under the **Environmental** heading. For additional information, APC White Paper #102 (Monitoring Physical Threats in the Data Center) is instructive to define these threats and some of the methods of protection available. This application note highlights the integration of the NetBotz environmental monitoring with *Digi* wireless sensing technology to expand the NetBotz sensor portfolio to include wireless devices.

Defining the Issue

As discussed in APC White Paper #102 (Monitoring Physical Threats in the Data Center), there are many common techniques for monitoring the data center for threats today. Many date back to the days of centralized mainframes, and have included such practices as walking around the physical space with thermometers and recording the temperature in a lab notebook to be recalled later, after a catastrophe.

Today, it is common to have a sophisticated network of monitoring and alerting capabilities in physical equipment such as UPS, Computer Room Air Conditioners (CRAC), and fire suppression systems, while other aspects of the physical environment are often ignored. Monitoring of the equipment itself is imperative, but not enough – the surrounding environment must be viewed holistically, watched proactively, and triggered simultaneously, to correlate events between the various monitoring tools.

As the monitoring tools have advanced in complexity, so too have the spaces they monitor. Many data centers today have equipment which does not lend itself well to a wired sensor connection, or are so remote as to make it impracticable to run wiring from a monitoring appliance to the desired location. Integrating the robust environmental monitoring technology in NetBotz and the wireless sensing technology of *Digi* resolves these issues.

Defining the Elements of the Solution

To monitor a data center robustly for potential environmental threats, several tool sets are necessary to completely span the spectrum of potential issues. In this section, elements dealing specifically with wireless sensing technology are listed, and briefly described. In the section following, these elements are assembled to create a wireless web of monitoring for environmental threats in a data center environment.

NetBotz: Environmental Monitoring

NetBotz appliances are network based devices designed to protect against physical threats, whether environmental or human, that can cause disruption or downtime to equipment in data center or wiring closet environments. An array of sensor types, which now include wireless environmental sensors, is available to accommodate a wide spectrum of environments and the threats that exist within these spaces. These devices can provide both proactive and reactive monitoring of these environments resulting in faster response and greater system uptime.

ZigBee Wireless Technology

At its core, the technology underlying the wireless transport for the supported *Digi* wireless devices is codified in IEEE 802.15.4. The communication protocol which utilizes this transport technology, called ZigBee, is an open global standard created and ratified by member companies of the ZigBee Alliance, of which Schneider Electric is a member. These devices are designed to be a low power, low cost technology, operating a secure protocol on battery power alone for up to several years. Operation is accomplished by transmitting on unlicensed frequency bands including the 2.4 GHz, 900 MHz, and 868 MHz. This wireless technology allows a user to create either a point to point or mesh network to transmit information from sensor to host appliance and back. In depth technical information detailing the IEEE 802.15.4 standard and ZigBee protocol is readily available from many public sources.

Digi: Coordinator

Each ZigBee network requires one and only one coordinator which is attached via an available USB port to the NetBotz host appliance in our application. *Digi's* XStick ZB (NAM Model XU-Z11) is a USB adaptor which provides connectivity from the NetBotz appliance to a low power wireless sensor network of *Digi* routers and sensors, described below.

Digi: Wall Router

From time to time, the *Digi* Wall Router (Model XR-Z14-CW1P1) may be necessary, either due to distance between wireless nodes or environmental conditions that affect wireless signal integrity (e.g. multipath). Each wall router acts as a signal extender and allows seamless communication with other *Digi* wireless devices. These nodes plug into a standard NEMA 5-15 outlet and are configured in the same manner as the battery operated wireless sensors, described below.

Digi: Wireless Sensors

Each *Digi* environmental sensor is a battery operated, wireless sensor that can monitor temperature, humidity, and light (NAM Model XS-Z16-CB2R) or temperature and light (NAM Model XS-Z16-CB1R). Each provide near-real-time sensing and are designed for long life and rapid deployment. These nodes will communicate to a router, if in range, and the coordinator that is in range.

Defining the Solution by Integrating the Elements

NetBotz appliances beginning with firmware version 3.3 will contain the necessary functionality to utilize the wireless sensing technology from *Digi*. **To configure a *Digi* ZigBee wireless network for use with NetBotz devices, the wireless network must first be configured using *Digi*'s X-CTU utility, available from *Digi*. It is only once this configuration is complete that the wireless network will operate properly in the NetBotz environment.** Further, each *Digi* wireless sensor must be configured to report their available sensors (i.e. light, temperature, humidity). Refer to the documentation accompanying the *Digi* wireless equipment and X-CTU application. Any issues configuring this wireless network need to be resolved by *Digi*. They are available at www.digi.com and 877-912-3444.

Once the *Digi* Wireless network is configured, the *Digi* coordinator is then connected to the NetBotz appliance via an available USB port and selected via the Serial Device Configuration dialog in NetBotz Advanced View. Until this configuration is complete, the *Digi* devices will not populate in Advanced View. Once complete, these devices will act as any other attached sensor device in Advanced View and can be managed in the same manner as any existing APC sensor.

NetBotz Monitoring Integration with Digi Wireless Sensors:

Each NetBotz appliance is capable of monitoring up to 26 *Digi* end nodes and supports only a single coordinator (i.e. one may only have a single ZigBee network per NetBotz appliance). End nodes consist of either *Digi* wall routers, or *Digi* wireless sensors as detailed above. Any combination of these devices is allowed, so long as the total does not exceed 26 devices.

A typical configuration may consist of 13 racks aligned in a single row. Rack 1 may contain the NetBotz appliance itself, with a USB attached coordinator, and if no other wired environmental sensors are used, it may also contain two (2) *Digi* wireless sensors. Racks 2, 3, and 4 may contain two (2) *Digi* wireless sensors each. It is recommended that in Rack 5 a *Digi* Wall

Router be used to boost the wireless signal to assure a robust signal as well as a *Digi* wireless sensor. Racks 6, 7, 8, and 9 are similar to Racks 2, 3 and 4. Rack 9 is similar to Rack 5, and the remainder of the racks (10 through 13) is similar to Racks 6 through 9.

In essence, one begins with a NetBotz appliance with a wireless coordinator, and hop approximately four (4) racks, placing sensors along the way, continuing by placing a router after this distance to assure a robust signal, and place additional sensors as necessary. Note that RF environments can vary greatly and wireless performance will vary based on many environmental factors.

Conclusions

Safeguarding against environmental threats is crucial to a comprehensive strategy for protecting the data center. For complete coverage of all the critical areas within such a space, it may be impractical to use a wired environmental sensor to monitor a particular section of this environment. To accommodate this need, NetBotz appliances may now utilize *Digi* wireless environmental sensors to monitor these areas and take advantage of seamless integration from wireless sensors, through a NetBotz appliance, to the InfraStruxure Central management platform.

About the Author:

Peter Kokolski is the director of engineering for embedded technologies in the data center solutions group at APC by Schneider Electric. Peter is an 18-year veteran of the electronics industry and has worked in the commercial, semiconductor, medical and military fields as an engineer and consultant. He received his Bachelor's degree in Electrical Engineering from Northeastern University in 1991, and Juris Doctorate from Concord Law School in 2010. Peter is a member in good standing with IEEE and ASTQB.