

Ensuring time is on your side



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John Edwards, senior director, Global Healthcare Solutions, at Primex Wireless, discusses the challenges, solutions, and benefits, of implementing process automation and intelligent power management applications to help hospitals and other healthcare facilities save time, reduce costs, boost productivity, and ensure optimal regulatory compliance and patient safety.

Automation driven by software is not a new concept. Ever since computer and networking technologies have matured, many large commercial and healthcare facilities have implemented automated building management systems that provide distributed monitoring and remote control of a facility's major mechanical and electrical systems, such as ventilation, lighting, power management, fire alarm, security, and emergency evacuation systems. However, such comprehensive and sophisticated building automation systems often prove to be too costly or complex for some hospitals to consider.

Now, with the rapid growth of IP (Internet Protocol)-enabled and wireless (802.11 Wi-Fi) technologies, healthcare organisations that may have lacked the resources to implement full-blown building automation can tap into emerging wireless and networking technologies that leverage the capabilities of their existing Ethernet LAN and/or wireless IT infrastructures to automate highly targeted processes and procedures.

Similarly, larger hospitals and networked healthcare campuses can utilise these emerging technologies to complement existing building automation systems, because, even in hospitals with such systems, there are still applications not fully covered. With the trend today towards IT convergence, this blending of new and existing software applications makes sound business sense.

In healthcare, as in other industries, innovative Wi-Fi based automation solutions are being developed to overcome challenges and automate processes and procedures required for an organisation to operate safely, efficiently, and cost-effectively. In most hospitals today, these procedures tend to be performed manually, are time- and labour-



Examples of wireless and digital clocks for time synchronisation from Primex Wireless.

intensive, often inaccurate, and are certainly not the most productive use of hospital staff and resources.

Three prime examples of how targeted, emerging Wi-Fi applications can be put to effective use in healthcare environments are:

- Wireless time synchronisation systems that ensure accurate timekeeping of analogue and digital clocks and computers throughout the facility.
- Wireless temperature and/or humidity monitoring systems for rooms that require temperature or humidity control, and/or refrigerators in which vaccines and other expensive pharmaceutical products are temporarily stored.
- Intelligent power management systems designed to save on energy consumption and reduce the facility's carbon footprint.

This article will discuss how these targeted applications can deliver high value to healthcare facilities, explain the underlying technology platform, and how each software-based application works in a busy hospital environment, as well as illustrating how process automation can be achieved in a cost-effective manner to improve accuracy and

workflow efficiency, while reducing costs and waste. Most important to note is how these new technologies can help make hospitals and clinic facilities better equipped to comply both with industry standards, and with regulatory requirements to improve the overall quality of patient care.

Time synchronisation: why is it critical?

Timing is paramount in today's healthcare facilities. Critical treatment methods, such as resuscitation and administration of fast-acting drugs, are often reliant on minute-by-minute actions. In addition, hospitals depend heavily on accurate time records when dealing with legal liabilities. In fact, every time a procedure is performed on a patient, the treatment is recorded, with a reference to the time, which highlights just why it is so important to ensure that the time on all clocks in the facility is "in sync".

Many hospitals across the globe have become members of the "D2B" or "Door to Balloon" Alliance. In joining, they agree to conform to standards established by The Joint Commission (formerly known as JCAHO, the Joint Commission on Accreditation of Healthcare Organizations). The D2B standard calls for a maximum period of 90 minutes between when a heart attack patient arrives in the emergency room, and that person's treatment with a "balloon", inserted to re-establish blood flow. Otherwise, the patient may be at risk of increased severity of heart damage or death.

The new wireless synchronised clock systems available today consistently outperform older clock systems, many of which have been around for decades, and can no longer be relied on for perfect synchronisation and accuracy. Using the existing 802.11 wireless network, all clocks within a particular healthcare facility can be programmed from a central software interface to synchronise all clocks and computers to the exact second.

Temperature control's importance

Many hospitals across the globe now operate under standards set by The Joint Commission and The Joint Commission International. The standard for ensuring proper drug storage requires that each medical facility monitors the temperatures in all refrigerators once or twice daily, and then records the time and temperature in a data log reserved for this purpose. In addition, hospitals must maintain certain thresholds for room temperatures and humidity levels to meet regulatory requirements and improve patient outcomes. For example, the operating room must meet Joint Commission and CMS (Center for Medicare/aid service) requirements. If the humidity is too high, it can cause infections and, if too low, clinical issues. Additional areas where ambient temperature and humidity must be properly maintained include storage rooms for dry goods and for food.

Hospitals typically operate numerous refrigerators in various departments and at nurse stations, which are used to store vaccines, temperature-sensitive pharmaceuticals, and biologicals, as well as patient nutritional products. Many prescription and non-prescription drugs must be stored within precise temperature ranges to maintain their original potency and efficacy. Improper storage, even for limited times, can reduce their effectiveness – and may even result in spoilage, requiring the drugs to be destroyed.

Manually monitoring these temperatures once or twice a day (including at weekends) can be an onerous task for hospital personnel. Even the semi-automated “audible alarm” systems installed in drug refrigerators by some hospitals still require a significant amount of manual effort, and constant diligence and vigilance, from hospital personnel. Whether this tracking and data logging task falls to nurses, pharmacy managers, lab technicians, or assistants, it takes precious time away from caring for patients.

Potential for financial losses

The financial costs and risk associated with drug spoilage due to out-of-range temperature storage are quite significant. One non-profit hospital and healthcare

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system reported huge financial losses caused by malfunctioning refrigerators. In one of these incidents, vaccine valued at over US\$25,000 had to be destroyed because the temperature had dropped to zero. In a case reported elsewhere, more than 6,000 doses of the N1H1 swine flu vaccine – available only in limited quantities at the time – were rendered worthless because a malfunctioning refrigerator dropped the temperature 30 degrees below the prescribed temperature storage range of 35°F to 46°F.

Should drugs be improperly stored, even more serious than the obvious financial risk is that of compromising patient care.

A situation that clearly exemplifies both the financial and patient risks of improper temperature storage is a class action suit recently reported in the Vancouver Sun newspaper in British Columbia, Canada.¹ The article describes how sperm samples from about 160 donors stored in a hospital laboratory’s cryopreservation freezer, which temporarily lost mains power, were rendered useless, and their genetic material possibly destroyed. Many of the samples were stored by patients undergoing chemotherapy or other medical treatments that could adversely affect their reproductive capacity. The freezer’s power loss stemmed from an electricity failure caused by a malfunctioning circuit breaker. The resulting legal action seeks damages of between CAN\$20,000 and \$100,000 for each of the donors – a costly proposition indeed.

Ensuring compliance

There is clearly an urgent need for healthcare facilities to be able to implement a fully automated cold chain sensing, tracking, and data logging system should temperatures start to drift out of range. This should be capable of issuing email alerts to appropriate personnel within, or outside, the facility. This would not only provide tremendous time savings for employees assigned to monitoring and data logging, but would also help eliminate waste and financial loss, ensure patient safety, and assure compliance with established standards.

With the “green revolution” in full swing, organisations of every kind are striving to reduce energy consumption. According to one survey, healthcare buildings account for 11 per cent of all commercial energy consumption, and are the fourth largest consumer of total commercial building energy – which includes site usage of electricity, natural gas, fuel oil, and distributed steam or hot water.² The survey also reports that electricity represents

about 38 per cent of this combined energy usage total. Saving even a modest percentage of electricity consumption would result in cost savings, and contribute positively to the facility’s green energy management profile.

One simple way to improve energy conservation is with an “intelligent” power management system capable of automatically powering down idle devices that would otherwise be in standby mode.

Older devices

Older devices not manufactured to EnergyStar standards are even more problematic. In most work environments, this could typically include a host of electronic devices, such as office printers, fax machines, projectors, copiers, and shredders.

Intelligent power management software can also be used to power down direct-wired or plugged-in electrical appliances, such as outdoor lights, televisions, exhaust fans, coffee machines, vending machines, microwave ovens, and even idle medical equipment and snow-melting cables on the roof. This would eliminate a wasteful and potentially costly power drain during weekends, nights, and other periods of non-use, especially in remote clinics where the office shuts down during weekends and holidays, or buildings where staff are not on site every day.

Remotely controlled through a Web-based interface, such a targeted application can provide facilities that lack a comprehensive building management system with a practical power reduction solution that reduces both electricity costs and carbon emissions.

Selecting an Ethernet/Wi-Fi-based solution

For hospitals and other healthcare facilities, the first step towards automating



Temperature and humidity sensors like these can be used to remotely monitor conditions, eliminating repeated manual checking, for instance to ensure the safety and integrity of refrigerated assets.

the processes detailed here is the implementation of a Web browser-accessible software platform. The platform must be capable of supporting multiple applications and designed to serve as a centralised application management system. It should be extremely flexible, able to handle whatever targeted applications are currently desired, and scalable to accommodate future applications as evolving needs dictate.

One such platform available in the marketplace today is from Primex Wireless Inc., a firm headquartered in the US with a growing network of international locations. The Primex applications management platform, for example, is designed to operate within any healthcare system's facility, or network of facilities, utilising the existing Ethernet or Wi-Fi network infrastructure.

Another key selection criterion in choosing a system is to evaluate the vendor's track record in the healthcare industry, as well as the implementation methodology used by the solution provider. It is critical to work with an experienced partner that not only understands the organisation's pain points and concerns, but is willing and available to work with the user's planning and implementation team in the system's design and installation.

A reliable solution partner can also help with IT infrastructure interface considerations, taking into account the system design and application functionality, as well security considerations, and other technical issues related to the Ethernet and wireless network topology. They can also assist in user training and effective knowledge transfer to ensure the user organisation can maximize the benefits of each application's capabilities.

Making the job easier

Targeted applications such as synchronised timekeeping, sensor-based temperature and humidity monitoring, and intelligent power management – all controlled through an applications management system – make it much easier for facility managers or engineers to perform their job, whether on-site, or from a remote location. For those responsible for facility management, round-the-clock, continuous system monitoring, and the instant issuing of automated email alerts if a clock, refrigerator sensor, room sensor, or any connected device, requires attention or service, confers a great measure of confidence and peace of mind.

The applications discussed here also deliver a significant value proposition for the hospital or healthcare system's top management, its professional staff, and other personnel, as well as every patient served by the organisation. There follows a brief description of the features,



An intelligent power management controller – these devices allow real-time or schedule-based remote control of electronic devices, lighting, and electrical appliances and equipment, by floor, zone, or device.

functionality, and benefits, offered by a networked software system and targeted automation applications that leverage existing Wi-Fi or Ethernet infrastructure.

Wireless time synchronisation

This application enables precise synchronisation of analogue and digital clocks with system management from a remote location.

The benefits include:

- Ensuring that people and processes throughout the facility are optimised around a single common time source to help schedules run more smoothly and ensure accurate record-keeping.
- Ensuring that surgeries, meetings, and other scheduled events, start and end on time.
- Eliminating facility maintenance costs spent on adjusting time after Daylight Saving Time or power outages.

Wireless temperature and humidity tracking

These use AC or battery power and advanced sensor technology to remotely monitor and track temperatures or humidity levels.

Key benefits include:

- Ensuring the safety and integrity of refrigerated assets.
- Reducing the risk of financial loss or litigation associated with drug or biological spoilage.
- Protecting dry storage goods from excess moisture.
- Automatically archiving device data and

system performance to provide a historical data log for trend analysis or to meet Joint Commission or internal quality standards.

- Freeing up the time of busy professional staff to focus on patient care.
- Improving levels of patient care, and meeting Joint Commission standards, by keeping temperatures and humidity levels within threshold in areas such as the operating room.

Intelligent power management

This application with Web interface allows real-time or schedule-based remote control of electronic devices, lighting, and electrical appliances and equipment, by floor, zone or device. Benefits include:

- Reduced costs via saving wasted electricity and standby power consumption during "off" hours such as at night, at weekends, during holidays, or during closed periods, at remote building locations.
- Time and labour savings by automating scheduled or *ad hoc* power activation of equipment, fixtures, and equipment.
- Promotion of "greener" practices within a single facility or multiple buildings. +

References

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 - 2 Energy Information Administration, Commercial Building Energy Consumption Survey (URL is www.eia.doe.gov)
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Primex Wireless

Primex Wireless Inc. "provides global healthcare organisations with reliable wireless synchronised timekeeping, temperature and humidity sensors, and intelligent power management solutions designed to improve patient safety, while reducing operating costs, improving staff efficiency, and meeting regulatory compliance".

A specialist in facility solutions, the company is a member of the International Federation of Hospital Engineering.

To learn more about how Primex Wireless has helped hospitals,
please visit www.primexwireless.com/hospitals

