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WHITE PAPER

# Open Standards-Driven Wireless Building Energy Management

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# Executive Summary

Reduction in energy usage has become a top priority for owners of commercial and industrial buildings, governments, utilities and others to help save money, but also because governments are increasingly requiring compliance with standards related to energy management and usage reduction. Examples include ASHRAE 90.1 and California's 2013 Title 24 Building Energy Efficiency Standards – a new, more stringent implementation set to go into effect July 1, 2014.

Under the revised Title 24 code, businesses will need to implement technologies that enable highly efficient and ultimately zero-net-energy buildings, such as intelligent networked systems for controlling and managing energy-related applications throughout a warehouse, office or other commercial facility. Wireless networking removes a number of limitations, such as which devices can be controlled (lighting, thermostats, plug-loads and $CO_2$ sensors, to name a few), where they can be placed, degree of granularity, and so on.

Lighting, of course, is where there is some of the greatest need and opportunity for implementing smart management solutions, and lighting also provides an entry point for expanding a company's energy management strategy. Automated lighting control systems allow lights to be turned off or dimmed to accommodate time and usage factors, providing the correct amount of light where and when it's needed. These systems can reduce building energy consumption by 70 percent or more, and when combined with LED lighting, savings can top 90 percent. Other benefits include improved operational efficiencies and enhanced occupant comfort.

Global revenue from networked lighting control equipment within commercial buildings will grow more than 200 percent by 2020, reaching $5.3 billion. A key growth driver, according to Navigant Research, is the increasing shift toward solutions based on open standards, which will ultimately simplify installation and improve selection for building managers.

The cost of wiring is incentive enough for many building owners to make the move to wireless systems, which are typically organized using a "mesh" architecture. This means that each device in the network can communicate with a controller through at least two pathways, and can relay messages for its neighbors. Data is passed through the wireless network from device to device, using the most reliable communication links and most efficient path, until the destination is reached.

The mesh network's two-way communication means that not only can an energy-management control system send commands to lights and sensors; it can also receive information back from them. The control system can log each light's real-time state, measure energy usage, and communicate whether lights are malfunctioning or need replacing. Through this two-way data stream, facility managers receive a host of decision-making information that allows them to maintain and tune settings in a timely way, as well as measure and verify the level of energy savings they are achieving.

The process of integrating wireless controls has typically relied on third-party or custom wireless adapters to enable wireless integration with existing fixtures. While they enable fixture manufacturers to take advantage of wireless controls without making any product changes or commitments, and are suitable for retrofit situations, these "two-box" solutions can be costly, especially for granular control, and lengthen the payback period. An alternative, of course, is to use zonal control to reduce these costs.

The next step would be embedding an integrated wireless module, consisting of the microcontroller, transceiver and antenna on a printed circuit board, directly into a light fixture's driver or power supply. While the per-fixture cost is lower than "two-box" solutions a third-party module manufacturer takes a profit on each unit, and the installation requires some custom engineering and wireless expertise.

Fully integrating the wireless radio-frequency (RF) IC into the LED driver is more desirable in terms of functionality and per-fixture cost. While this approach is quite cost effective, it involves the most demanding engineering effort and requires wireless stock keeping units (SKUs).

The time is ripe to bring to market a solution such as that recently announced by Current's Daintree and LG Electronics, a digital serial interconnect pluggable option developed to drive deployment of wirelessly connected lighting systems integrated with building- and energy-management systems in commercial office and industrial facilities.

## Current's Daintree and LG Electronics – An Ideal Joint Solution

The two companies collaborated to embed the ZigBee wireless networking standard directly into LED drivers used in LG LED overhead troffer lighting fixtures, enabling interaction with the Daintree ControlScope™ networked wireless control platform. The ControlScope platform can control the LG fixtures out-of-the-box, provide actionable information through data analytics, and integrate the system with building-management systems.

With this option, the same module is used for all drivers with the appropriate interface, eliminating the custom engineering required for both the integrated module and the integrated wireless IC. Some lighting manufacturers believe that the digital serial interconnected pluggable modules' time-to-market and SKU-management advantages trump the cost and other advantages of the previous two options.

Facing compliance with new, more stringent energy-efficiency standards, facilities can realize efficiency improvements of up to 90 percent utilizing this approach. Moreover, an open standard-based solution can deliver cost and flexibility benefits compared with proprietary wireless systems – signaling that a new era in networked-wireless building energy management has arrived.

## Product/Solution Specifics

Initial LG products with wireless drivers include LED troffer fixtures and retrofit kits. The resulting joint solution is expected to yield significant savings for users, both in up-front costs and in energy efficiency following installation – as well as from the market-leading efficacy of LG LED troffers.

Using wireless LED drivers eliminates both the expense and installation challenges associated with a separate wireless adapter which has been required for granular wireless control of overhead troffers in commercial and industrial buildings until now. Current estimates that with the LG-Daintree solution, companies can expect to save up to 85 percent per fixture in equipment and labor when installing wireless communication, and can also improve energy efficiency by up to 90 percent.

Current's Daintree and LG are both seeing growing demand for fully-integrated wireless lighting control and have committed to deploying open standard solutions as the best approach. Utilizing open standards and interoperability to their fullest allows best-of-breed third-party products to join the Daintree platform, broadening customer choice and helping keep costs down.

## LG Troffer Products

2'x2' Troffers
Wattage: 18-36W
Color Temperature: 3500-5000K

2'x4' Troffers
Wattage:  26-48W
Color Temperature: 3500-5200K

LG LED troffers serve a variety of applications. Customers can use lensed or architectural units to enhance interior design or to improve lighting conditions for any application. Lumens per watt (efficacy) varies depending on the desired wattage and color temperature of the troffer selected with high efficacy 2'x2' and 2'x4' troffers delivering over 130 lumens per watt.

Customers need ways to optimize their use of LG's advanced lighting and other energy products. Enabling the LED troffers and retrofit kits with ZigBee wireless communication capability allows them to connect seamlessly out-of-the-box with the Current's Daintree ControlScope system. This simplifies installation and will help drive increased adoption of fully-networked and controllable LED lighting solutions.

# Current's Daintree ControlScope
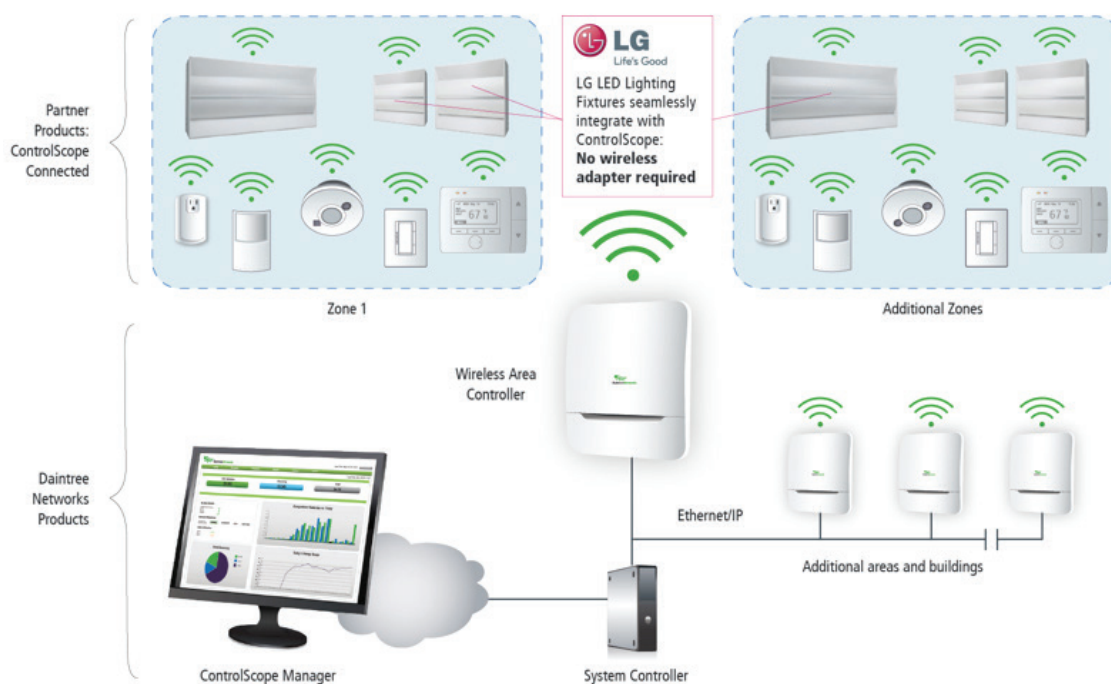


Current's Daintree ControlScope is a complete wireless control solution built on years of development in the most trusted, reliable, wireless mesh networking standards. Daintree provides the wireless network communications and intelligent control software, and customers are free to choose from a variety of 3rd party control devices including sensors, fixtures, programmable thermostats, and plug load controllers – all using the trusted ZigBee standard for wireless communications. In the ControlScope solution, an intelligent wireless mesh network takes the place of physical control panels and miles of dedicated control wiring. The Current's Daintree Wireless Area Controller (WAC) manages both the network and the control intelligence for a floor or wing of a building. The networked wireless devices all communicate with the WAC and each other wirelessly, either through an external adapter or through standard wireless communications capabilities built directly inside the device. A ControlScope system provides full-featured commercial lighting control for fluorescent and LED lighting products, as well as programmable thermostat automation and plug-load control.

Facility managers can set automated and manual control strategies through the web-based ControlScope Manager application – from scheduling and occupancy control to daylighting, demand response, task tuning and more – and those commands are applied wirelessly to individual zones, or across the building or large enterprise. Setup is simple, and making changes is simpler: it's all done through the application, with full management over multiple facilities from any Web browser. The result is the most flexible, powerful and cost-effective networked wireless solution addressing multiple key energy building applications.

## About LG Electronics USA

LG Electronics USA, Inc., based in Englewood Cliffs, N.J., is the North American subsidiary of LG Electronics, Inc., a $52 billion global force and technology leader in consumer electronics, home appliances and mobile communications. In the United States, LG Electronics sells a range of stylish and innovative home entertainment products, mobile phones, home appliances, commercial displays, air conditioning systems, solar energy solutions and LED lighting systems, all under LG's "Life's Good" marketing theme. LG Electronics is a 2013 ENERGY STAR Partner of the Year. For more information, please visit **www.LG.com.**

## About GE Current

Current is GE's digital engine for intelligent environments. Current makes physical spaces more efficient, productive, and safe by combining LED technology, an innovative Daintree ecosystem, and targeted software applications. Backed by the power of Predix, GE's industrial-strength IoT platform, Current and its ecosystem of technology partners is helping unlock value in spaces ranging from commercial buildings, to industrial facilities.

Current's Daintree is a channel-friendly product line with leading strategic and technology partners helping serve its customers globally, with major locations in Silicon Valley, CA, Cleveland, OH, and Melbourne, Australia.

Further information is available at **www.products.currentbyge.com**