Supermarket of the Future

Kroger is bringing grocery retailing into the 21st century.

By John Karolefski

he outside of the 55,000-squarefoot Kroger store in Cold Spring, Ky., looks like a regular large supermarket. A quick glance inside finds the expected departments: produce, dairy, meat, center store and so on. Shoppers

push their carts up and down aisles and around the perimeter in search of bargains and their favorite brands.

But this store, 10 miles southeast of Kroger's hometown of Cincinnati, serves as a laboratory to deploy and study the latest instore technologies. The country's

largest traditional grocer has digitized this supermarket and is setting the standard for how food retailing will be conducted in the 21st century.

Welcome to the Supermarket of the Future.

"We are interested in creating a better shopping experience," Brett Bonner, the chain's VP of research and development, says emphatically.

To achieve that goal, Kroger has put together an ecosystem that blends shopper-facing hardware with sophisticated technology behind the scenes. The company introduced the foundational technology for this ecosystem 18 months ago. This enterprise IT architecture, called Retail Site Intelligence, is designed for stores of the 21st century. It relies on ZigBee wireless mesh networks to integrate long-







Tags blend neatly into the shelf edge and clearly display prices. A store clerk scans the bar code ID to to adjust product facings if planogram changes are needed.

life battery sensors, hand-held scanners, point-ofsale devices and video management software into a next-generation platform for retail applications such as loss prevention, store automation and analytics.

At the time of the launch, Chris Hjelm, Kroger's SVP and CIO, noted: "Retail Site Intelligence is, above all, about 'Customer First' innovation. We are leveraging technology to help customers have the best possible shopping experience in retail stores, whether by more easily finding the products they



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want or saving time at checkout. We expect Retail Site Intelligence to be the cornerstone of the technology infrastructure for Kroger stores in the future."

That would mean some changes will be on tap for the 2,640 supermarkets and multidepartment stores that Kroger operates in 34 states and the District of Columbia under two dozen local banners, among them Kroger, City Market, Dillons, Food 4 Less, Fred Meyer, Fry's, Harris Teeter, Jay C, King Soopers, QFC, Ralphs and Smith's (not including the merger with Milwaukee-based Roundy's, announced shortly before this issue went to press).

Kroger officials gave *Progressive Grocer* a tour of the Cold Spring store to see the new technology in place.

Scan, Bag, Go

At the entrance of the store, customers are greeted by a Scan, Bag, Go kiosk loaded with hand-held scanners to use while shopping. After swiping a Kroger Plus loyalty card for identity purposes and to load previously selected coupons into the scanner, a shopper picks up a large plastic bag to fill with groceries. When shopping, she can scan and bag products taken off the shelf, including fruits and vegetables in the produce department. When finished, she scans a special bar code on a terminal at the front of the store that transfers her order to the checkout. The process saves time and reduces checkout lines.

"It's all about making the customer experience the best possible," explains Dion Perkins, Kroger's project lead for ZigBee networking. "The primary users of Scan, Bag, Go are the savvy budget customers. When they come to the store, they know how much [money] they have set aside for groceries," he says, explaining that the scanner keeps a running tally of the order, displaying the grocery bill while the customer shops. Checking out is a seamless experience."

Kroger officials were surprised that seniors have been the most frequent users of the system, first installed a few years ago and monitored ever since.

"A lot of seniors are going online for coupons," affirms Perkins. "There is information on Kroger. com for those customers who shop in a Scan, Bag, Go store. If they know something about the system before they get there, there is a lot less anxiety. Once in the store, there is a TV monitor that walks through several of the steps. There are directions on the produce scales. If shoppers are not using the scanner properly, a pop-up screen asks if they need assistance," which is provided by a nearby store associate who's alerted by the technology.



CHECKING IN

Customers swipe a Kroger Plus loyalty card to identify themselves and load previously selected coupons onto a handheld scanner they use while shopping. Kroger's Keith Daly demonstrates how it's done.



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-Brett Bonner, Kroger



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-Dion Perkins, Kroger

And are they alerted at checkout if a shopper attempts to leave the store with some items in the bag that haven't been scanned?

The hand-held scanner monitors such possible incidents — whether intentional or by mistake with a validation system that detects behavior that doesn't match up with past shopping trips. Spot checks are also performed randomly at checkout.

Scan, Bag, Go is installed in 15 Kroger supermarkets in the greater Cincinnati area. Last month, shoppers could begin using their smartphones, instead of the hand-held scanner, by downloading a newly developed mobile app.

Kroger has been focused on reducing long lines at checkout for several years, ever since the company introduced QueVision, a system that combines infrared sensors over entrance doors and at the front of each checkout line to monitor store traffic. When the store is crowded and long lines are possible, the store manager is alerted and can open more registers. Average wait time at checkout is now less than 30 seconds.

"Once we were able to measure our shopping queue time, we were able to reduce the average wait

TEAM PLAYERS

Kroger execs Dion Perkins, Brett Bonner, Doug Meiser and Titus Jones, and Cold Spring Store Manager Tom Armbruster (from left, in ties) pose with ZigBee Alliance Chairman John Osborne II (far right) and store associates. time of the shopper by nearly four minutes," says Bonner. The system was piloted in the Cold Spring unit and now is deployed at all Kroger stores.

Shelf Edge

Center store is outfitted with "smart shelves" in the form of small rectangular tags that show digital prices and ads. Some 2,000 Edge tags have replaced paper tags and the need for store associates to spend time changing them periodically by hand.

"The shelf itself is fully digitized; it is part of the store's ecosystem," explains Titus Jones, Kroger's project lead for the digital shelf Edge project, who since 2011 has been researching and working on prototypes of the tags developed by Kroger. "Customers like it. The prices are bigger and brighter, and it's easier to read. We've had customers say they hadn't even noticed it, which in our mind is good, because then it looks like what they are used to."

Indeed, the tags blend neatly into the edge of the shelf so they don't give a bulky or awkward appearance. What shoppers don't see are planogram changes sent directly to the shelf. When store clerks scan a product and then scan the shelf's bar code ID, changes to the shelf set are downloaded and space can be adjusted if needed.

In the future, the tags may be able to provide nutritional information and motion video, and even be



able to communicate with a shopper's smartphone.

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"But we're still in the test-and-learn phase," cautions Bonner. "We don't want to make a commitment beyond this store. There's a lot we learned in this store, and we are still learning. Kroger's intent is to provide the best digital experience and best in-store experience for our shoppers. The shelf Edge blends both of those technologies into a seamless experience."

Temperature-monitoring System

Like all grocers, Kroger wants to ensure the safety of food displayed in the refrigerated and frozen food cases. Nobody wants to sell or buy ice cream that's been thawed and refrozen, or risk illness by eating food that's gone bad as a result of a malfunctioning cooling system.

Kroger has been aggressive in preventing such incidents by installing temperature sensors every 4 feet in its display cases. The Cold Spring store has up to 250 small-sized sensors installed as part of the FAST Alert system (the acronym stands for Food at Safe Temperature). All of the company's stores are scheduled to be equipped with the system by the end of this year. The sensors check temperatures every 30 minutes, instead of having store clerks manually check thermometers and alert the manager if there's a problem. The system reduces the chance of spoiled food, reduces labor and saves energy.



"Who is not interested in safe food?" Bonner asks. "Everybody wants safe food. Our preferred approach is to monitor everything through the Internet of Things. We developed it and deployed it, and are very pleased with the results."

Perkins, an R&D engineer, is also pleased with how Kroger is digitizing the store for internal reasons. "We think we are operating efficiently," he says, "but now we can measure it and prove it. Every time we think there's nothing else to improve, there is additional data from digitizing the store."

Nobody knows that better than Bonner, who has orchestrated the technology implementations at this smart store. But he's quick to share the credit.

"Innovation is broadly based in the company," he says. "The value that R&D adds is, we can put on the wheels and build the cars they envision, if you will. That's a unique paradigm in retail.



PRODUCE PRICES Kroger's Dion Perkins uses the Scan, Bag, Go hand-held device to scan the bar code on tomatoes, and then weighs them to determine the price.



COLD ENOUCH A meat department associate stocks the shelf beneath a temperaturemonitoring sensor, which immediately detects any cooling system malfunctions.

"R&D typically invents systems that have promised value," he continues, "but before the enterprise realizes that value, there are many talented people involved. That talent is chiefly in Kroger technology and operations, and key retailing areas. Once they have the basic tools that we can provide and some of the inventions we can provide, they start adding value that is incalculable. That's when you see things like QueVision; Edge; Scan, Bag, Go; and things we have coming up, like how associates interact with their hand-held devices. We have so many innovative ideas coming from the Kroger organization that we are going to have several years of game-changing retail in front of us." PG



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What is ZigBee?

Retail Site Intelligence, the enterprise IT architecture behind Kroger's supermarket in Cold Spring, Ky., represents the next generation of retail technology. The Cincinnati-based grocery giant partnered

with two technology providers of retail site intelligence: elnfochips and Wincor Nixdorf.

The platform is designed to handle retail applications such as store automation, loss prevention and analytics. In stores, it uses ZigBee wireless mesh networks to integrate long-life battery sensors, hand-held and point-of-sale scanners, and video management software.

But what exactly is ZigBee?

ZigBee — more specifically, Zigbee Retail Services — is an open, global standard that connects devices in stores to enhance the shopping experience and help make retailers more efficient. It's the only global wireless networking standard focused on device-to-device communication, the foundation of the Internet of Things.

John Osborne II, chairman of the ZigBee Alliance, a Davis, Calif.-based global ecosystem of organizations developing smart and innovative wireless standards, says: "Here is the way that I try to explain it to folks. Everyone understands WiFi and Bluetooth. ZigBee is the third leg in that RF [radio frequency] spectrum. It is machine-to-machine communication. It is how devices talk together."

For the Kroger supermarket in Cold Spring, that means the hand-held scanners, shelf-edge tags, temperature sensors, security cameras, scales and other devices.

"ZigBee Retail Services is not creating a product that goes on the shelf and a consumer buys it," Osborne notes. "It's an infrastructure that allows us to plug in devices very inexpensively. It builds a mesh network. If a component or

access point goes down, you're not on the phone to Support to fix it right away. It's a self-healing network."

He lists three ways that the network provides value for retail: It saves money, keeps people safe and reduces costs.

"We can pass the savings on to the consumer," he enthuses. "We've done that. We've set that standard."

Osborne stresses that the platform simplifies the store environment and makes it more efficient and more-cost effective for Kroger.

"Now we go fix things when we want to fix things on a regular schedule," he explains. "It's secure right out of the box. For example, temperature tags have a 10-year life expectancy. That allows us to do things like seal the cases and make them food-safety ready. We can basically throw the battery in a recycling bin when it dies, because we don't want to spend time, money and effort sending people out to replace batteries. Then it does not become cost-effective for that particular device. We are economizing the environment."

The ZigBee Alliance consists of 450 member companies from around the world: one-third in North America, onethird in Europe and one-third in Asia. According to Osborne, the focus in China is on home automation, while it's on commercial buildings in North America and Europe.

—John Karolefski