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High-Speed Warehouse
Intelligent, Efficient and Highly Visible: How the Systems of Today will Fuel the Warehouse of Tomorrow

By Lisa Terry

The warehouse manager was just notified that an inbound shipment is going to arrive ahead of schedule. He quickly eyes the system dashboard to see workers' locations and tasks. He then consults his business process management application to determine the best workflow for this shipment and selects workers to pull in for receiving, notifying them via VoIP-enabled (voice over Internet protocol) wearable terminals. Those workers set up an automated receiving conveyor at the designated dock door. As goods are quickly unloaded onto conveyors, scanning/decoding tunnels read the carton IDs and verify them against the purchase order. Some cartons are automatically routed to radio frequency identification (RFID)-equipped forklifts according to preset slotting plans, while others are cross-docked directly to shipping doors and shipments assembled according to load optimization software for their designated trucks. Sounds too futuristic? It's not — all of these steps employ applications and technology that are already available or will be soon. Three years from now, at least a few of these are likely to be standard operating procedure at any given warehouse as companies strive to make within-the-four-walls operations faster, more accurate and visible, lower in cost, and more interdependent with events up and down the supply chain. Smart use of data and processes are seen as the route to improved customer service and reduced costs.

"Delivery has been fairly well optimized. You're not going to move trucks a whole lot faster, and a lot of goods are on planes now," says Scott Westlake, worldwide manufacturing industry director for Cisco. Instead, he says warehouses "have to be able to sense and respond in the context of the global supply chain. It's not just moving goods through and overcoming things that slow them down, like compliance, Customs and environmental laws. Collaboration is so much more important." All that might sound more like something conceptualized on a whiteboard than at work in the trenches of the average warehouse. But changes are already coming. Here are several concrete ways that the systems you're installing a few years from now will look different than today's:
Hybrid hardware/voice. The day of the voice interface has finally arrived, thanks to technical improvements and better integration with other warehouse systems. "This is the next level of operations," says Tom Kozenski, product marketing leader for Red Prairie, who says voice is garnering a high level of interest from clients. Three years from now, leaders will have moved beyond picking for voice to apply it to other operations.
VARs can expect to be selling hybrid devices that handle combinations of integrated voice response, scanning, RFID decoding and imaging with a display and keyboard or screen-based interface and VoIP capabilities for more ad hoc communication, providing

the right modality for the task at hand. Psion Teklogix's PTX Connect, for example, is an enterprise communication software platform enabling mobile workers to communicate in real-time using a variety of options such as walkie-talkie style Push-to-Talk, VoIP, and a combination of server-based voice, text and scribble messaging. Coupled with a 2-D imager in a mobile device, workers can take pictures, add comments to them on screen, and transmit the final images including notations over a wireless network. On-demand mobile printing is another variation on the connected worker theme; in the interest of productivity, pickers are more likely to generate labels on the fly than work from preprinted labels, and printers will be used for multiple applications throughout the day, says Bob Danahy, director of global mobile and wireless technology for Zebra Technologies New software architecture. Increasing visibility and collaboration means workers will need to access multiple host applications from the warehouse floor; terminal emulation just won't cut it. Web services and service-oriented architectures will be required to help frontline users get access to required applications, and users will need the operating systems and processing power to enable that. "If you're doing rote picking [green screen] is probably okay," says Mark Wheeler, director of marketing, warehouse and distribution industry solutions for Symbol Technologies. "Other areas are more complex — receiving, returns, cycle counting, kitting. They need access to more information." "It's like Cisco's AON strategy, the ability to move processing farther into the network, doing preliminary processing for some systems," says Bob Eckles, director of industrial goods at Intermec. "Devices will continue to expand in processing capability and become more peer data collection devices." More RFID. Many of today's hurdles should be history three years from now, when RFID will be used more heavily to locate and move goods within the warehouse. RFID asset tracking will help locate resources, make smart decisions about what to dispatch to which task, and analyze asset use. Another likely application: using RFID to track compliance-essential data, such as whether a product contains lead, in order to comply with Europe's RoHS/WEEE directive. "2008 to 2010 will be when RFID is ready for prime time," says Grant Opperman, CSO for supply chain service provider D.W. Morgan. The chief benefit will be labor savings, he notes. As RFID takes hold, warehouses will be able to use a lot more automation, such as sortation and automated storage and retrieval systems, says Matt Ream, senior manager of RFID systems at Zebra. Smarter networks. Most every piece of auto-ID and material handling equipment is wired or wireless Ethernet capable these days, to enable visibility and control of every facet of operations. Networks three years out will be essential to visibility and collaboration and will need to support a variety of traffic including machine-to-machine, machine and AIDC (auto information and data capture) devices to warehouse control and warehouse management systems, floor devices back to hosts, VoIP, and high volumes of RFID data. It's "getting dashboard data out to everyone, including the $6 an hour woman working on a dock in Taiwan – they need to see demand," says Cisco's Westlake. But the network's role is shifting. "Intelligence in the network can help enable and optimize business applications," says Kevin Raack, **RFID solutions marketing manager for Cisco. Data such as RFID "needs intelligent routing. You want intelligence at each location across the network," filtering data before sending out what's pertinent. "A service-oriented network trolls traffic in the Web and decides where it should go based on information in packets," says David Morgan, CEO at D.W. Morgan.** Business intelligence tools. "Voice and RFID will

create a wealth of data, but to sort the data to come up with actionable information is more complex," says Intermec's Eckles. "So they'll need business intelligence, data warehousing, real-time dashboarding and data visualization." Workflow modeling and simulation tools will help model outcomes of different business decisions and offer insight into how the supply chain could deal with them, adds Mike McCaghren, VP consumer goods and retail consulting for IT consulting firm Neoris. Load optimization. Heightened customer expectations and a focus on costs mean some operations will be planning not only what goes on a truck, but how it should be loaded to maximize space, enable easy last-in/first-out deliveries for multiple stops, and reduce the manual work entailed when an order doesn't ship as planned because boxes didn't fit. Traceability and compliance solutions. Warehouse and transportation solutions will increasingly be required to track data related to a product's chain of custody. That means collecting, storing and passing along data such as lot and serial numbers, what's in the shipment, who handled it, and where it was when, at every step of handling. "CEOs have got to sign off on company statements," for Sarbanes-Oxley and other compliance, says Intermec's Eckles. "They need to know where data comes from, its accuracy and reliability. They need to be able to bring up data all the way through systems and audit trails." Maximizing resources. Pick-based optimization, or slotting, together with labor management will increasingly help warehouses make the most of their resources. Using these tools, inventory can be placed according to demand, and together with time-motion studies of warehouse processes and allocation of labor hours according to expected demand, managers can maximize productivity. Compressed order cycles will mean more planned, as opposed to opportunistic, cross-docking, requiring planning of resources as well, says Irving Chernofsky, senior director of fulfillment, RFID and supply chain intelligence for Oracle. Gridding — tracking people and equipment with RFID or other signals — will help locate the closest resources for the next transaction. Better scanning. Scanning technology based on microelectromechanical systems, or MEMS, which combine electronic circuitry with miniaturized mechanical devices, will likely be commonplace in warehouses a few years out. The miniature devices mean lighter and smaller laser scanners, faster reading, better recognition and processing of poor quality or damaged bar codes than traditional lasers, and extreme reliability. Imaging will also be more widely used. "Imaging can help verify that the warehouse received the right item," by sending the image off to a buyer to verify and avoid costly delays, says Symbol's Wheeler. "That's a major problem in industries that have no item level bar code." Intelligent material handling. Warehouse control systems that manage material handling equipment are being more tightly integrated with management applications to enable fully informed, real-time decisions about how to make the best use of resources and manage orders. Both material handling equipment and data collection applications will need access to data — a task that will require integration. One sign of the souped-up of equipment is the new RFID Forklift debuted by Intermec Technologies and forklift maker Cascade Corp., which incorporates RFID technology into the machine's infrastructure. Drivers can read and encode RFID tags without leaving the vehicle, the device can read a carton's RFID tags and automatically determine the best way to pick it up (low hard squeeze, for example) and managers can get real-time data on vehicle locations and activity that can be used to manage labor and assets more efficiently, via solutions from Cisco and RedPrairie. Tighter integration. To seamlessly link to the entire supply chain,

warehouse management applications need tight integration with other applications, not only other execution applications like transportation management, but supply chain planning, event management and optimization as well. Planning windows are being compressed to rely more heavily on demand signals like POS data, so warehouses need to be able to respond to minute-by-minute order changes. “Integration is a key aspect of speed, both for data and material,” says Oracle’s Chernofsky. Integration also enables management by exception, essential as warehouses get bigger and velocity rises.