3/18/2002 @ 12:00AM

The internet of things

By Chana Schoenberger and Bruce Upbin

"'We need an internet for things, a standardized way for computers to understand the real world.'"

Stores have eyes. Now they're getting brains. Soon tiny wireless chips stuck on shampoo bottles and jeans will track all that you wear and buy.

The future is under construction at a Sam's Club warehouse store near Tulsa, Oklahoma, but you can't see or hear it. Microchips inside cases of razors and detergent silently alert wireless sensors that the goods have arrived at the doors of the loading dock. Additional sensors built into store shelves alert staffers when a product needs replenishment.

It is the ultimate in inventory management: No hand-counting necessary–just let the chips speak up to vouch that every unit ordered has indeed arrived, on time and intact. In ten years nearly every consumer item will probably bear a tiny chip that continually broadcasts its existence to radio-frequency readers at loading docks, store shelves, entrances, security stations and parking lots–just about everywhere.

Much as the bar code helped companies know what they were selling, these new tags, which bear a unique number known as an electronic product code,

will let businesses track what customers are buying. The chips contain no more information than a bar code does, but they eliminate the manual labor of scanning. This summer the Sam's Club in Tulsa will begin testing chips on individual items. Consumer-product makers figure that they'll tag cases of goods within two years, pricey items within four and everything they make within a decade.

The benefits to manufacturers include far fewer wasteful inventory glitches; to retailers, lower losses to shoplifters. Procter & Gamble's goal is to use the intelligence provided by the tags to cut its inventory by 40%, some $1.5 billion. P&G's preliminary analysis is that they could lop 4 cents off the dollar per transaction.

And once these radio-frequency identification (RFID) chips are ubiquitous, more advanced uses are expected to emerge, making retailers omniscient about every product moving through the supply chain. Prada, the Italian luxury goods designer, is attaching Texas Instruments chips to each handbag, pair of sleek spike heels and slinky dress in its glamorous new boutique in New York's SoHo district. When customers hang their selections in the dressing room, the chips activate a flat-panel video screen to play clips of models wearing those items and a video of the designer Miuccia Prada's suggestions for accessories.

Research on new uses is under way at the two-year-old Auto ID Center at MIT, which has $9 million in research funding from a consortium of big companies and government agencies that include Pepsi, Johnson & Johnson, UPS and the U.S. Department of Defense. Kevin Ashton, the executive at Procter & Gamble who heads the center, foresees that RFID will lead to complete automation of data collection. "We need an internet for things, a standardized way for computers to understand the real world," says Ashton.

Radio chips have long been used to tag livestock and are immensely successful in toll-collecting machines on highways. ExxonMobil's SpeedPass wireless payment system allows drivers to pay for gasoline by waving a key-chain fob at the pump. It has enlisted 6 million drivers.

New networks will benefit from smaller and cheaper chips, more powerful and less expensive radio receivers and smarter software to interpret the data. Alien Technology, achip company in Morgan Hill, California, is developing chips the size of a bit of glitter for MIT. Alien uses chemicals to etch ultrafine perforations on a silicon wafer. The resulting shards, suspended in solution, are poured down a sloped surface covered by a dimpled plastic film. As the tiny blocks tumble down the slope, gravity pulls them into micropores.

Paired with a small antenna, the chips broadcast on an unlicensed frequency near the FM band, with a range of a few centimeters to several meters. sapand Sun Microsystems are among the vendors working on the software and servers needed to transform the chip data into a useful form. Eventually the information will feed into the databases that companies already use to track their inventory.

The Star City Casino in Sydney, Australia, installed the tags on 80,000 employee uniforms in 1997 to keep them from disappearing. Its system has cut the replacement rate in half, to less than 10%, says Lyle Ginsburg, a partner at Accenture, which designed the system.

The Gap, in conjunction with Texas Instruments, which makes the tags, recentlytagged a store in a suburb of Atlanta, Georgia. It tracked jeans from the distribution center to the store shelves, in which readers were embedded. Scanning at 50 tags a second enabled the store's personnel to get a computer snapshot of where in the shop every pair of boot-cut women's indigo jeans was located.

McDonald's is also trying out the tags. In Boise, Idaho, 31 restaurants give out chip-embedded key chains carrying stored-value payment information, which is linked to a customer's credit card or checking account. The tags, from FreedomPay, a startup in Wayne, Pennsylvania, rack up rewards, such as free sodas.

"You walk up, place your order and wave the wand. In two seconds it's authorized and approved," says David Rosal, a strategy director for McDonald's, which is also testing the SpeedPass in 450 of its restaurants in Chicago.

Before the tags proliferate, however, backers will have to overcome obstacles of cost, technology and privacy concerns. Consumer-products makers need the cost of the radio tags, now at $1 to $2 apiece, to drop to less than a penny. MIT's researchers plan to have a 5-cent tag ready in three years. Similarly, the price of the radio-frequency readers must drop from a few thousand dollars each to $100 to justify putting them throughout a store, says Simon Ellis, a supply-chain futurist with Unilever. ThingMagic, a spinoff of MIT's Media Lab that developed the prototype readers used in Tulsa, hopes to have $100 models available this fall.

Another problem is how to pick the numbers of multiple tags from the sea of transmissions. ThingMagic has a stop-gap solution: Rather than recognizing individual tags, its prototype readers monitor which cases sit on which pallets, thus assuming that a case is going by when its pallet goes by. But once cases are open, this approach can't catch theft or mistakes.

Privacy advocates are quaking over the prospect that anyone with a radio-frequency reader, including the government, could find out where a passerby had purchased his shoes. It would be easy for Wal-Mart, say, to use its in-store readers to figure out which competitors its customers frequented. Even scarier, some credit-card issuers are considering implanting radio tags in their plastic cards.

"It's quite serious," says Lee Tien, a lawyer with the Electronic Frontier Foundation, a watchdog group in San Francisco. "Once you go down that road, one has to consider the possibility that though Wal-Mart and Kmart might not share that information with each other, there will be times when that information will be demanded by the government for purposes of investigation."

It's a long way since the first bar-coded item, a ten-pack of Wrigley's gum, was scanned in 1974. Ten years from now such a package may have a chip inside.