

## What does the story of another low-power, low-cost radio standard tell us about the future of RFID?

June 9, 2008—At about the same time as Electronic Product Code (EPC) technology was being developed, another somewhat similar standard was being born. ZigBee is a standard for mesh networking, in which tiny low-powered radios form networks by passing data among themselves.

Mesh networking is a cool idea on a chalkboard. During the late 1990s and early 2000s, academic mathematicians enthusiastically calculated what shapes and communication styles mesh networks should have, what their power would be, and how they would work.



But what was the point? While ZigBee could pass information over short ranges at low costs, RFID could identify things over short ranges at a lower cost. And while ZigBee was simpler and cheaper than Wi-Fi, which was becoming the dominant force in wireless local-area networking, it was also less powerful. What was the killer application that did not need the luxurious bandwidth of Wi-Fi, but needed more networking capability than could be had from the simple identification provided by RFID?

ZigBee enthusiasts and entrepreneurs wrestled with that question for more than five years. There were disappointments. Opportunities appeared and shimmered, but turned out to be mirages. There was military ZigBee, medical ZigBee, even ZigBee-enabled RFID readers and tags. None of these led to large orders. ZigBee appeared to be in trouble, crushed between cheaper RFID and more powerful Wi-Fi.

Two years ago, I mentioned ZigBee at a meeting with one of the world's largest wireless networking companies and got a derisory reaction: ZigBee, explained the Wi-Fi product manager, was a dead technology. Wi-Fi could do everything ZigBee could do and would soon be cheaper, too, due to the huge volumes of Wi-Fi devices being manufactured. At about the same time, an MIT engineering Ph.D. pointed me to a detailed paper showing that ZigBee would fail due to unavoidable bandwidth crunches. It all seemed very convincing.

Then the U.S. electricity industry decided, with a little encouragement from the federal government, that it was time to replace decades-old electricity meters with new, network-enabled devices that would not just monitor energy consumption but potentially control it as well. Wi-Fi was too expensive and too power-hungry; the point was to reduce power use, not add to it. Since all the meters, air conditioners and light switches were conveniently located right alongside one another, the solution was obvious and ready to go: ZigBee. Today, millions of dollars are being invested in ZigBee home-automation technology.

What does this have to do with RFID? The lesson of ZigBee is that all major technologies go through

cycles of hope and despair, of exuberance and pessimism, of adoring experts and then scathing experts. This happens until those first big commercial applications kick in. Then it's hard to find a naysayer anywhere. So if you find yourself wondering whether the RFID revolution is ever going to come, remember ZigBee—where the right questions turned out to be how and when, not if.

*Kevin Ashton was cofounder and executive director of the Auto-ID Center.*