

## White Paper

# RFID is to Cellular as Barcode is to Phone Booth

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### Why RFID?

What was wrong with barcodes that Wal\*Mart has placed the burden of new expense and complication into the midst of regular production woes? The answer to this can be found by looking into the past and the future. First, the past and how cellular came to be more than just a luxury item for the wealthy. The first cellular radios had one channel to communicate, and if someone was already using the "line", one would have to wait until it was free. As the technology evolved, several channels were created, but still there was a limit. Using cell towers that could cover several miles in all directions, a system of frequency re-use was established. If channel 868 was in use in one part of the city, channel 868 wasn't used by another cell tower for 20 or more miles. A hexagonal pattern was created to help determine what frequencies could be used where, and further division of the frequencies could be accomplished if the channels radiated at 60 degree angles (thus creating 6 directions of signal beams), versus the omnidirectional (circular beams) patterns of the past. As the cellular industry boomed and nearly everyone had a phone, city areas could not service most subscribers, resulting in "No Service". How did they resolve this issue? Smaller, less powerful cell towers, call microcells where implemented in a dense pattern throughout the city, reusing the frequency channels over and over, but in a "micro" fashion. This meant

less expensive tower construction, less power consumption, better reception, and most importantly, more customers talking whenever they wished. In this new age, the phone booth had become a small history museum.

### RFID versus Barcode

There is no doubt that RFID will one day replace the barcode. The barcode will still exist, just like the phone booth, for the occasional need. The need for RFID today is not easy to understand, since today's version is much like the first cell phones, bulky and cumbersome, and "who is really going to use this?". Go several years into the future, where the RFID tag is a fraction of a cent (yes, just like every memory technology, the cost will 1/2 itself each year for the same memory size), and nearly every product that would make sense to include it has one attached or embedded. Take the cellular analogy and go RFID microreaders, where dock door portals and hand scanners are antiques. Picture every cubic inch of the superstore covered in the RFID read sweep. Aisles are embedded with inexpensive microreaders, and any product (tagged) can be inventoried real-time. Warehouses, supply trucks, freezers, storage areas, and checkout counters are all inventoried and instantaneous decisions are made. Would you run a tighter and more efficient business if you knew exactly how much product you needed to create, down to the single item level? Would you re-route a supply truck to a store with a higher

out-of-stock level than an alternate store? If your product was placed on the wrong shelf, would it sell as well as it could have on the appropriate shelf? If this product was a featured sales item in a marketing campaign, but the item was not yet in some stores, would you advertise differently?

As the technology blankets the product at all stages of its supply chain, decisions can be made real-time, saving millions, if not billions of dollars in lost perishables, incorrect sequencing of batch runs, overstocks, stock shortages, and stock shrinkages. Barcodes simply cannot provide this level of information due to the physical nature of the technology. Line of sight readings, corruption of the barcode markings, and environmental conditions limit the ability to perform mass reads to a population.

As the RFID technology matures, and cost of implementation is reduced, the number of products tagged will increase. As the collected data becomes available and it is interpreted, new thoughts and ideas on how to optimize the supply chain structure will become apparent. By removing the lag in response time to changes in the supply flow, the corrections can be applied sooner, and reduce waste in the process.

There are many who believe that the barcode can provide many of the same pieces of information today, but the same level of collection is not performed today for barcodes. This is true of singulated events, such as barcoding performed in production batch runs. Once the product is

cased, bundled, or containerized for shipment, the tracking capabilities have become significantly reduced.

Looking into the past, and then back in the future, it seems apparent that RFID has capabilities beyond the present-day implementations, and the electronic format of the data allows yet another layer of separation from the barcode. Even with the miniscule size of memory being 96 bits, the entire product id can be assembled completed with a fairly large serialization field number. Further technological features can be implemented as dictated by the product, such as temperature, shock, and expiration period.

RFID today is a new technology to the supply chain, even if RFID is not a new technology. Implementing the technology is a several phase undertaking, including the foundation level of properly encoding a tag, the infrastructure of selecting the correct data to encode, management of the database, interfacing systems to share data, and the physics of RF communication environments. Knowing where the technology is ultimately headed helps prepare for the journey, and justifies the trip expense.