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RFID Privacy Hoopla

MORGAN HILL, California

With so much RFID related discussion in the press recently, especially with regard to item-level tagging initiatives, privacy seems to be ratcheting to the top of people's minds… This discussion is in response to privacy concerns, with an intent to help educate those whom may be misinformed about the contents and capabilities of RFID.

No worries folks… passive RFID doesn't have a battery and the tags don't broadcast or transmit a signal. They rely on harvesting their energy from "readers", when in their vicinity… much like a WiFi system where you need to be within reasonable range to interact. The tags simply "reflect" the reader's signal back (e.g. like a mirror reflecting light back to the source). For example, the reader asks; "what value do you have in bit location 1?" to which the tag can either reflect the signal back – or not. If it reflects, it might represent a "1", if not, it might represent a "0." These are referred to as "binary" data (1's and 0's), or digital logic. It goes on through this process until all the "bits" are received from the tag, i.e. "0110 1010 0010 1110 1010 1011 0010…" Guess what that means? You guessed correctly… nothing… unless you have a data base that maps these 1's and 0's (digital logic) to something meaningful.

These 1's and 0's (binary data) get grouped into "chunks" which are called "words" and are then converted to other data formats, such as decimal (e.g. characters to include 0 – 9), or hex (e.g. characters to include 0 – 9 & A – F). An example follows on the upcoming UPC discussion.

I should clarify one point in the referenced editorial – the "brain" or "IC" or "chip" is really small and might be the size of an ant as described in the editorial, but the chip is useless without an antenna. Below is a typical UHF RFID tag. The copper colored section is the antenna. If you look directly under the dime pictured to the right, you will see a tiny dark spec in the center of the tag antenna. This is the IC. So it is small, but obviously not when attached to the antenna. Smaller antennas certainly exist, but their read range is dramatically reduced. So ignore those sci-fi rumors that someone can attach a "grain of sand" onto a person and that they can be tracked by satellites (this is completely untrue). The functional tags themselves are typically on the order of "a few inches" long.

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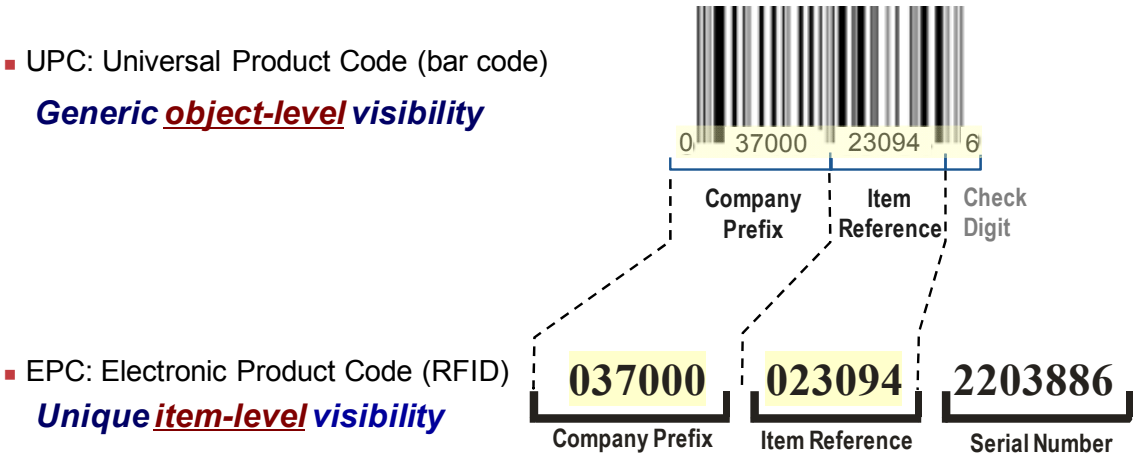
So if they can't give their location, are limited in read distance, and simply reflect a bunch of 0's and 1's (which are meaningless out of context), you're probably wondering why all the hoopla? You're right… these devices are really neat and can be very useful, but they're not quite the "trackers" some folks make them out to be.

Let's take a simple example – this article talks about apparel being tagged. Some tend to view this negatively, believing they will be tracked inside and outside of the retail store – but let's think about this. The tag is typically an integral part of the bar code label, which contains human readable information – a series of numbers representing what the product is. These too are meaningless unless you map them to a data base. But what's on the RFID tag? It's the same as the bar code/human readable printed information, but with the addition of a random unique serial number – the reason for the serial number is for automatic counting (e.g. for inventory management).

All standard retail barcodes for a particular product are the same – no uniqueness, so you can't use them for inventory management. RFID offers the uniqueness to help derive business benefit. Take a 150oz container of Liquid Tide for example. On one variety, the bar code has the following human readable print: 0 37000 23094 6. If you have the proper data base, you would be able to map the first six characters to the manufacturer (Proctor & Gamble in this case) and the next six characters would map to the product (150oz Liquid Tide with Downy). But if you had 4 of these on a shelf, they would all have identical markings, so they cannot be counted automatically.



Example UPC Bar Code Compared to EPC RFID Code

RFID has this exact same information, but appended to the end is a unique serial number, for example, maybe #2203886, #1858427, #4594619, and #1058990. The system would read 4 unique items with the same "stock keeping unit" (SKU) number and have an inventory count of four. That's it… So why not just add a serial number to the bar code or to the human readable section? Well, you certainly could, but the other advantage of RFID is that it does not need "line of sight" to operate… no one needs to physically locate the tag and present it to a bar code scanner or conduct a physical inventory – as long as the items of interest are in the "field of view" of the RFID reader, the reader does all the heavy lifting – automatically.

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So let's talk about a common question: "What if someone had a reader and read through your trash to see what you purchased – can they do that?" The answer is "maybe" – again, if they can map the series of 0's and 1's to an appropriate data base, then guess what they have? The SKU!… the same thing that is written on the bar code… so let's help them save some money – why not just read the numbers on the bar code tag, or simply look at the product label which more clearly defines what it is without having to reference a data base?…

And as for reading what items a customer may be looking at or purchasing within the retail store, keep in mind that while the items may be tagged – the person is not… One might argue that the person may be carrying a RFID enabled loyalty card with a serial number which could be mapped to the person (assuming again, that one had access to the data base). Most loyalty cards are not RFID enabled, but if we were to assume the loyalty card was RFID enabled, then perhaps this association "could" be feasible – not that it would matter, but here's a remedy for the concerned: "simply don't carry the loyalty card." Just destroy it if it makes you feel more comfortable."

One more point – unless the reader is purposefully set in "very short read range mode" to isolate each item, then it would be reading anything in the readers "illumination path." Not that this is how the technology is being used, but as an analogy, think of an overhead light in a retail store – assume the illumination from the light was the RF from a reader – they are similar in coverage. Assume only one light was on and assume the light was 20 feet overhead. It covers quite a bit of area, right? Now, assuming all of the illuminated items were able to be read, that might be representative of what would be associated with the shopper… as they move through the store - the end result might be that they were associated with over half the store… not much use, is it?

For the apparel application, the tags are certainly removable – often on what are termed "hang tags" (e.g. tags on a string), so if really concerned, simply pull them off and dispose of them before leaving the store. But for those really concerned that the retailers might know what you purchased – you might want to pay with cash, because today – even without RFID – when you purchase items with your credit card, an itemized list is kept by the retailer identifying exactly what you purchased and tying them directly to your credit card… so nothing's really much different from the info read by the bar code reader or from the human readable information, it's just that a sense of awareness has been raised and people tend to fear the unknown. And as for the concern that a person may be tracked, well, the RFID tags can't do that – at best they simply report their serial number when they are in the vicinity of compatible reader, but those concerned may want to reconsider carrying their cell phones, because cell phones certainly are capable tracking people across vast locations. Still, we tend to ignore things like this as the convenience generally outweighs the risk.

EVENT MANAGEMENT / AMUSEMENT PARKS

Amusement parks are an interesting application – think how traumatic it is for a parent to lose contact with a child amongst thousands of people in a large theme park. We now know that the tags themselves aren't able to be read unless they are near a reader, and they just have a serial number which is meaningless unless tied to a database, but where this comes in handy is a child is simply instructed to present his wristband (with RFID) to

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the nearest 'animated character kiosk" if they are lost. The kiosk knows its own location, reads the tag, associates it with the child (if desired) and if the parent views any kiosk in the park, they can be reconnected.

Here's a hypothetical example of how the RFID enabled kiosks might be distributed in a theme park of the future (not implemented in this park – this is just an arbitrary example).

What's in the tag? Just a random unique serial number… again, useless unless you have tapped into the event management's data base, which is highly unlikely. And if concerned about privacy… don't bother associating the serial number with a name… just build the application to send a text message of the location and tag ID to a pre-defined number if the unique number of interest is presented to a kiosk.

What additional benefits might this have for the consumer? Rather than carrying around a pocket full of receipts for each member in the family, the RFID bracelet might have admission privileges for various areas within the park – maybe for admission to a concert, or to restrict admission of under-aged children to "grown up rides", or to permit unlimited soft-drink refills for all and adult beverages for adults, or entrance to a lunch buffet with an all-inclusive pass, etc. So the benefits to the consumer can include enhanced safety as well as convenience and for the park management, the automation is a plus for logistics and with the proper application, curbing counterfeit passes and ticket scalping are also minimized.

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APPLICATION	FEATURES	BENEFITS
Event Access / Tickets	Authentication	Anti-counterfeit Curb Scalping Activity
Admission	Logistics Management	Entrance Access Special Event Access Enforce Height Limits Enforce Age Restrictions Auto Seating Guides
All-Inclusive	Self-Dispense Management	Self-Serve Soft Drinks Adult Beverage Management Optional Meal Access
Location Kiosk	Connect with Family & Friends	Children, Family & Friends automatically connected when RFID bracelet is presented to kiosk

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Applications involving people has always been a touchy topic. But now, knowing what we do, let's discuss what potential harm RIFD might have in monitoring preschoolers. First let's discuss the process today. Today, staff is responsible for accurately accounting for each and every child throughout the day – whether they are in the classroom, in the restroom, or in the playground. With so many children to account for, it's easy to lose track of one – but even one is too many. If more than a certain number of children exit into the playground, additional staff needs to notified to help with the load – this is a manual process today.

With RFID, nothing more but additional security is brought into play. Now, with readers mounted at each doorway, the unique number assigned to each child is tracked, so the administrative staff is automatically alerted when more staff is required, and they have an accurate count of how many children left the classroom and entered the playground. More importantly, they can automatically account for every child re-entering the building – and the count must be the same as the exit count, otherwise a breach has occurred and the staff is notified of a missing child. Nothing stops administrative staff from continuing the manual process as a backup.

If an emergency occurs, such as an earthquake or fire, the staff has an accurate count of all children that have passed through these read points, again, enhancing safety. These tags are merely random unique serial numbers mapped to the children in the application database. So let's assume someone had a reader with exceptional read range and read the ID of a child in the playground. It begs the question: what possible

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harm might that invoke? The tags and readers can be set up with various levels of authentication for security purposes and the data base would certainly be secure. So, it's difficult to comprehend how unintentional readers, reading a series of meaningless 1's and 0's can derive value or how they can jeopardize safety of the child. The tag does not contain the name or address of the child… just a unique serial number. And features can include the ability to block viewing permissions for unintended readers without a password if desired. For additional security, maybe new tag IDs are assigned each day, each with yet a new ambiguously random unique ID which is only meaningful to the secure data base – so the old numbers simply expire.

For the parent and staff, this only helps insure every child is accurately accounted for throughout the day. And the tags could be encoded to help staff with other useful information, for instance, perhaps tag #0111 1010 0111 0110 1010 1100 0110 is today assigned to a specific child - perhaps this tag has a bit indicating that this specific child is allergic to peanuts, so when the child enters the cafeteria, staff is alerted of such.

Is this unique number secure? It certainly can be more so than most might be led to believe, especially if the ID within the tag remains a random unique serial number and the smarts are maintained in the secure database. Think about badge readers often used to gain access into buildings – those are considered relatively secure, right? (otherwise we wouldn't trust them to protect our building assets). They use a similar topology and most are RFID cards with just a couple dozen random 0's and 1's tied to a secure data base, either granting access to the card or not. Believe it or not, the general purpose RFID tags discussed here can offer significantly more authentication and security than many of the existing legacy access control systems, so when properly designed, applications can certainly be used for simple accounting tasks.

So those are just my two cents – hopefully helpful to those new to RFID.

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About Alien Technology
Alien Technology is a leading provider of UHF RFID products and services, including RFID ICs, inlays, readers, services and education. Alien is headquartered in Morgan Hill, California, with Alien Technology Asia in South Korea and the RFID Solutions Center located in the Dayton, Ohio region. Alien also maintains sales offices in the US, Europe, Asia and Australia.

Learn more about Alien's award-winning Higgs™-3 RFID IC, our performance-leading Squiggle® inlay product line, our high performance readers, and the renowned RFID Academy at: www.alientechnology.com.