

## RFID - A Wavelength to Grasp

Soumyajit Dutta.

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For the last few years, Indian IT firms like T.C.S, Wipro, Infosys have earned most of their revenues by doing businesses in the fields like body shopping, Y2K projects, ITES, consultancies and business process outsourcing. And now they have set their minds on yet another emerging field that is radio frequency identification or RFID.

### RFID: Next Step to Barcoding:

RFID—is it a new word to you? Wait. It is none other than a very simple technique of giving physical products unique IDs and then spotting them using radio waves. In other words, it is the next step after barcoding, which has revolutionized the retail industry some years back.

Let us look at barcodes first. Barcode is a handy tool to recognize an item by machines. It stores data without any magnetic device or an expensive and sensitive electronic chipset or integrated circuits. Yet it has some problems. The user has to be present near the tag during the identification process. They can be used only when there is a line of sight with the code. Barcodes can be used only one at a time. And, worst of all, barcodes do not contain much useful data. As an example, all Pepsi bottles of a certain size in a store will have the same barcode.

The manufacturer has no use for a specific barcode once it is out of the production facility. For the retailer, barcodes are used mostly as automatic price tags that the computer can read. But there may be situations where manufacturers would love to track their items after they are shipped. Retailers would want to know whether an item is missing from the shelves or whether it is being stolen. Barcodes cannot help here. RFID tags can, while doing much more. Unlike barcodes, each RFID tag is unique. To take the same example, each bottle of Pepsi will have a different RFID tag. Such coding has numerous utility. It can help in automatic counting, for instance. The only other way to know how many bottles are there in a loaded truck is by counting

manually.

Manufacturers can, through a network, track their goods well into the retail store and take action if there is a mishap, like withdrawing all the bottles that went in a particular truck. At the moment, there is no way of identifying goods that came into a store at different times.

RFID tags can be useful for retailers too. They would know if an item is missing from the shelves. About 10% of all items in a store are out of stock. Retailers can catch theft through RFID tags. No body can tamper with an RFID code. It is of no wonder that companies like Wal-Mart, Tesco and Gillette have said that they would switch over to RFID soon. Wal-Mart, in particular, has told all its Top 100 vendors that they would go live with RFID by 2005.

### Being Technical about RFID:

An RFID tag has an antenna, a substrate and an integrated circuit. The circuit has coded information that is it has at its heart a small inexpensive chip that contains information, which can be programmed and retrieved using a reader through contact less communication. That is the system consists of an RFID reader as well. The reader emits radiation that a tag will detect if it is in the zone, usually within 100 meters. The tag can be active (emitting radiation) or passive (not emitting radiation). Each has its advantages and disadvantages. So we can say that the RFID system is divided mainly into three parts. 1. **Controller System:** Controller interacts with reader to collect tag data via data packets. 2. **Reader and Antenna:** Reader broadcasts signal through antenna. 3. **RFID Tag:** Tag affixed to physical product receives signal and is charged with enough energy to send back an identifying response.

Now, we will see how it works. Every item contains a microchip with a unique identifier called an **Electronic Product Code (EPC™)**. This radio frequency identification (RFID) tag allows precise tracking of the product. Cases and pallets can

carry their own unique tags. Take an example of a system consisting of Retail Store, Warehouse and the Plant .1. On the retail floor the moment a customer takes a product from the shelf, 'smart shelves' automatically order more. Stock people and distributors keep the shelves full so that customers can buy what they want. And in the back room the EPC™ network tells the retailer exactly what's on the shelf and in the stock room as well as what's rolling off the truck. There is no need for clerks to maintain costly buffer stock or manually break a pallet down in order to check every case. 2. In the warehouse the warehouse manager quickly routes shipments to the right place because he can look up what's in the warehouse and on every track. Duplicate and missed shipments are things of the past! 3. In the plant, manufacturers organize their runs based on up-to-date information and know an item's destination as it comes off the line.

If an accident involving a defect or tampering arises, only the affected products need to be recalled.

#### **Application Areas:**

What makes RFID attractive as well as lucrative is its ability to allow data collection without human intervention and also the fact that it is relatively tamper-proof. It is difficult to tamper with it because it is fabricated in an industrial facility. This throws open several exciting applications in the areas of supply chain optimization, access control, anti-counterfeiting and asset tracking. 1. **Access Control** : Prickled by the terrorist attack in December 2001 , the Indian Parliament has started using an RFID-enabled security system that uniquely identifies each approaching car as ' friend or foe' . It does this using a system of embedded RFID tags (in the car) and readers installed before they approach the gate. 2. **Supply Chain Optimization**: RFID helps a firm re-establish control over production processes in geographically dispersed locations by tracking pallets/containers through the entire life-cycle of the asset. Such a real-time supply chain 'tracker' can only be created by using 'people-free' scanning in place of costly manual barcode scanning , which can be easily manipulated . Such instant monitoring of assets delivers real value. The British army ur-

gently needed tank tracks in Iraq; a costly Antonov – the world's largest air cargo plane – was to be hired for transporting the equipment from the UK to the Middle East. However, after querying the logistics network (that provides a real-time view of assets by relying on automatic scanning through RFID systems) the logistics team found tank tracks (with affixed RFID tags) already in theatre, thus saving the cost of leasing the aircraft for an expedited delivery. 3. **Anti-Counterfeiting**: Given that RFID chips are hard to replicate, they can be used for ensuring the authenticity of high-value currency notes, revenue stamps and passports among other things. Another emerging application is in bridling the distribution of spurious drugs – RFID systems can help monitor drug packages during the entire supply-chain from the manufacturer to the retailer, making it harder to introduce fake drugs. 4. **Asset Tracking**: One can create high-end loyalty programmes by using RFID cards that can be read as soon as the customer ('asset') walks into the store. The store manager would receive instant information about the approaching person including his/her personal preferences and buying history.

Besides, in a highly networked world, RFID has both the capacity and proficiency to reduce costs associated with a company's supply chain. If the pundits are right, this technology could help shave off \$500 billion in inventories out of the US economy! Wal-Mart expects to save billions by 'hyper-optimizing' its already sufficient supply chain.

#### **Some Shining Indians & Where We Are:**

Indians and technology make a heady mix indeed. Just as Gururaj Deshpande, Sabeer Bhatia and other Internet high-tech honchos begin to fade from the limelight, here comes another bunch riding the next big technology wave-RFID or radio frequency identification. Take a look at Savi's Vikram 'Vic' Verma, Matrics' Piyush Sodha and OATSystems' Prasad Putta. It is noteworthy that another Indian – Sanjay Sarma, commonly referred to as the '**father of RFID**' – has engineered this wave. 1. **Sanjay E. Sarma** is an unassuming academic whose work is anything but RFID. He is known as the father of RFID. *Business Week* has recently identified him as one of

the key innovators in the eBiz 25, along with the likes of Michael Dell and Steve Jobs! As former director of the Auto-ID Center at MIT, he has been at the forefront of shaping the RFID ecosystem and driving adoption by creating standards. His efforts have yielded fruit and a new global standards organization, EPCGlobal, has been formed to carry the work forward.

Sarma is a professor of mechanical engineering at MIT – he ‘discovered’ RFID while getting robots to automatically identify objects by ‘looking’ at them. His effort since 1998 has been to reduce the cost of a tag and facilitate the creation of standards to spur mainstream adoption. His vision is to have RFID tags on each product, especially the creation of ‘intelligent’ pharmaceutical packaging. This, for instance, can warn consumers if a medicine is past its expiry date .2. **Vikram ‘Vic’ Verma** got into RFID quite by accident – he met Rob Reis, who had once got separated from his son in a supermarket and was thinking of ways to track ‘lost’ children. The duo came up with an ‘electronic leash’ that ‘told’ parents about the location of their children. Though this venture failed, it led to interesting opportunities like tracking containers and war materials for the US army during the first Gulf War. There has been no looking back since. Under Verma’s leadership, Savi has grown from a \$20-million start-up in 1999 to a \$70-million blue-chip, VC-backed technology pioneer with a market valuation of over \$400-million. Given that the RFID market is expected to grow to \$3.5 billion by 2007-08, Verma hopes to make Savi a dominant player in the RFID solutions space with annual revenues in the vicinity of \$500 million.

Verma’s sagacious business sense has helped him to stay away from the hype and focus instead on solving real problems – like helping the US army create ‘precision-guided’ logistic systems where managers know the exact co-ordinates and contents of specific containers. This has replaced the brute force ‘just-in-case’ inventory model that resulted in ‘Iron Mountains’ of unused inventory that had to be maintained and protected. A smart system helps reduce the wartime theatre logistics foot print and eliminates uncertainty. A top US air force commander involved in the Iraq war says: “(Back) in the Desert Storm, we had mountains

of containers that never got opened .....that’s not happening this time”. It is a common talk that RFID has ‘saved’ a few US soldiers in Basra from ‘starvation’ when they got stuck in a huge sandstorm that resulted in extremely poor visibility. Worse, there was intermittent enemy gunfire. They couldn’t locate their ration containers: instead of searching through hundreds of boxes because reading the labels was impossible, they used RFID readers to locate a container with cheerios and milk! Look forward to hearing more about Savi and Verma. An alumnus of the Delhi Public School and La Martiniere , Kolkata , Verma’s message to Indian entrepreneurs is “there is a huge opportunity in applications”. He is looking to expand Savi into India to tackle some of the toughest problems in customs processing and asset management. 3. **Matrics** owes its ‘existence’ in large part to the unfortunate shooting down of a US fighter during Operation Desert Storm. The difficulty in locating the pilot led to the National Security Agency looking for ways to quickly retrieve missing personnel—two scientists found a way to adopt and apply RFID to quickly locate ‘assets’. Keen on commercializing their success, they teamed up with **Piyush Sodha**, a serial entrepreneur, and **Matrics** was born in late 1998 with about \$500,000.

A testament to **Matrics’** potential is the \$15 million that VCs pumped into it during the darkest days of the dotcom doom. These are no ordinary VCs. Sodha has garnered some heavy-duty backing: the Carlyle group, which includes luminaries like George Bush senior and Lou Gerstner (ex-CEO of IBM), to name just two.

**Matrics** is getting noticed—it recently-secured a multi-year \$25-million contract to create a baggage tagging system that allows one of North America’s most heavily travelled airports to handle ever-increasing volumes without any loss of passenger satisfaction and safety. “At some point...increased (human) labour leads to higher costs, greater errors and less security ....RFID provides an automated way to track bags ...” says Sodha. This large contract underscores the quality of **Matrics’**

products, which compete with offerings from behemoths like Intermec and Texas Instruments. Sodha is unfazed by such competition in a nascent market where future success is not guaranteed. He is a Delhi boy, having done his initial schooling from Delhi Public School and picking up a Wharton MBA after graduating from IIT-Delhi. A typical IIT product, he says: "IIT teaches you to tackle the unknown". He goes on to predict that, "RFID will replace barcodes in coming years", and this will create "huge, huge" opportunities for Indian entrepreneurs to provide systems integration services, including hardware, software and business process re-engineering.

4. Prasad Putta got deeply involved in RFID as Sarma's student at MIT while doing his master's after graduating from IIT-Madras. He felt a need to embed 'human intelligence' into software for supply-chain automation and OATSystems was born.

OATSystems has grown from just five people to over 90 in a span of three years and is profitable! With over 20 paying customers – attracting \$11.5 million in VC funding – Putta strongly feels that RFID delivers real value for early adopters. "For some, the technology is an issue of viability, while for others, it is about survivability", he says. He feels that success is dependent on the finding customers who value an RFID solution at current price points.

**Some Shortcomings:**

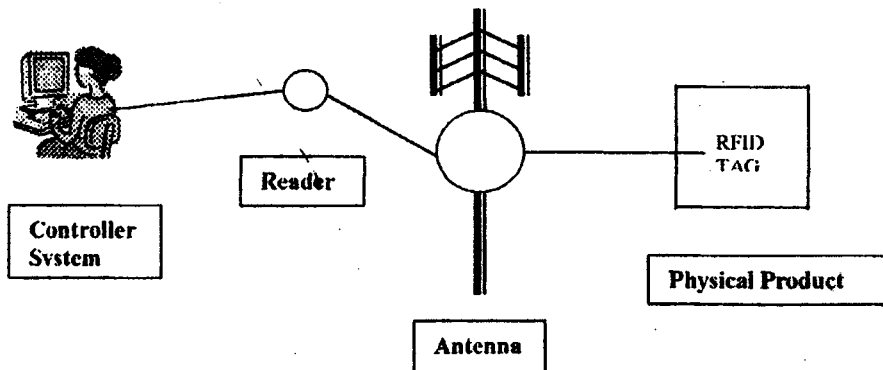
In spite of the huge success in the field there are issues to be solved. The cost of an RFID tag has to come down from between 20 cents to a dollar. More-

over, different companies use different standards which are mostly recovered after the genesis of EPCGlobal. And there are issues of spectrum licensing, particularly in countries like India.

**We Will Win:**

But above all, we are in a healthy position at the end of the day as large number of companies begins using RFID; Indian companies expect huge opportunities in consulting and software development. Indian companies like Infosys Technologies, Wipro and Cognizant Technology Solutions are preparing to launch themselves into RFID technology. Infosys, for example, has been interacting (there is no formal agreement yet) with Sanjay Sarma, a MIT professor who has been trying to derive RFID adoption in the US. For Infosys, the major opportunity in the next 1-2 years will come from consulting and pilot studies. RFID solutions have to be customized for particular vertical or company. According to Prasad Putta, RFID opens huge opportunities for India—for solving internal problems and exporting RFID services globally. RFID systems require a strong grasp of radio frequency engineering, hardware and software integration –all areas where Indians can leverage their engineering expertise to provide world-class solutions. But remember one thing that to become a Global Major in this field we have not only to maintain our current success rate but also fortify ourselves with much more specializations to compete with the current blue-chips.

**Let's hope for the best.**



**Fig: A Simple RFID System**