The Place of Emerging RFID Technology in National Security and Development

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Abstract

RFID (radio frequency identification) is one of the system solutions for tracking and tracing objects both globally and locally using RFID tags. It is an auto-ID procedure for identifying objects automatically within a geographical area. It allows information about an object to be collected automatically without having to handle the object or enter its data manually. RFID uses tags which communicate information by radio wave through antennae on small computer chips attached to objects so that such objects may be identified, located, and tracked. This technology has found a significant areas of application in business supply chains, in medical line, in security applications, and in fact many areas of human endeavor.

As Auto-ID and RFID technologies are developing at an alarming rate around the world with new information appearing daily, particularly on the Internet, this paper aims to describe the technology of RFID, the areas of applications of this technology particularly in industries, security and health care management and the potential benefits of adopting the technology. The overall aim of the paper is to sensitize Nigeria to start tapping this technology for national development and security.

Keywords: *RFID, Tags, Antennae.*

1. Introduction

RFID or Radio Frequency Identification is a technology that enables the tracking and/or identification of objects and living things using radio waves. Unlike ubiquitous bar-code technology, RFID technology does not require contact or line-of-sight for communication.

RFID technology is an automated system of wireless data capture, consisting of two parts: the tag (or transponder) and the reader. The tag is a silicon chip that contains information, usually a unique numerical identifier, transmitted by an attached antenna to the RFID reader through radio waves. Depending on the radio frequency and power source, readers can pick up the radio waves at a range between three and

thirty feet and read the stored digital information on the chip (**Mariko Yoshihara 2008).**

The precursors of RFID technology were first widely used during World War II to help identify ally or enemy planes. Due to its efficiency and falling cost, RFID technology soon expanded into the commercial sector. Compared to magnetic strips or barcodes, which usually contain only generic, category-levels of information, RFID tags can carry significantly more data, be reprogrammed with new data, and also be read faster, from farther away, without being in a direct line of sight (**Mariko Yoshihara 2008).** RFID tags can be embedded in products, government-issued ID cards, credit cards, toll devices and even people with the aim of tracking the products or people with ease.
The block diagram of RFID is presented below.

2. RFID COMPONENTS:

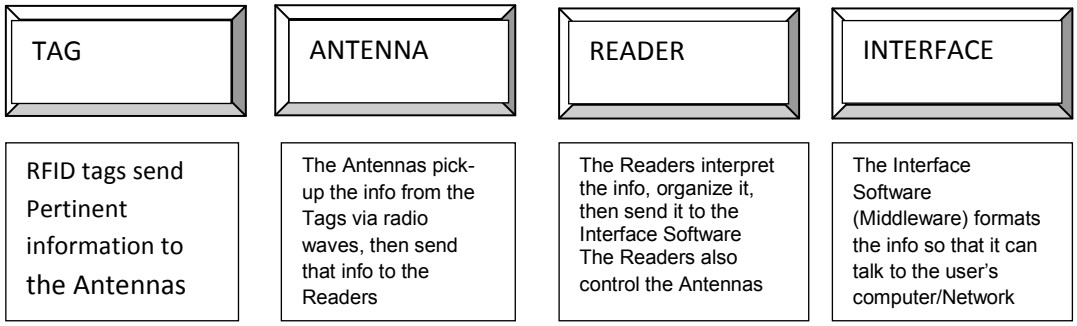

Figure 1. Block Diagram of RFID

The Tag or Transponder can be either active, passive or semi-active. It responds to a signal from the Interrogator (reader/ writer/ antenna) which in turn sends a signal to the Computer. The Tag comes in a variety of shapes. It is made up from a chip (IC) and an antenna. Depending on your application it may be embedded in glass, or epoxy, or it may be in a label, or a card. Passive tags get all their power from the signal sent by the interrogator. As well as using this radio wave to carry the data, the tag is able to convert it into power. This means that the tag is only powered when it is in the beam of the interrogator. The tag then uses a technique called backscatter to reply to the interrogator. This does not involve a transmitter on the tag, but is a means of "reflecting" the carrier wave and putting a signal into that reflection.

* RFID Tags do not require line-of-sight.
* RFID Tags can store far more information than bar codes.

* Some RFID Tags are writable, so information can be updated as time goes on or as the tag
travels to different locations.* Some RFID Tags have sensors that can record information. For example, a tag on a shipment of frozen foods could record the temperatures that the foods were exposed to.
* RFID Tags can go on all kinds of objects and even on living beings.
*Tags come in many shapes and sizes.

The tag can be passive, battery assisted, or active.

Battery assisted tags are just like passive tags (they use backscatter) but they have a battery to provide the power to the chip. This provides a big advantage, because the tag is not dependent on the strength of the carrier from the interrogator to provide the power it needs. Now it can use all the power from the battery and so is able to work at a greater distance from the interrogator.

Active tags, have not only a battery, but also some form of transmitter on the tag. The disadvantage of having a battery is two fold. One, it adds cost to the tag, and two they run out of power eventually. The decision on which one to use will depend on your application. Semi-passive tags do not communicate with a reader, but instead, use a battery to perform other functions, such as to power the internal electronics or write information obtained from monitoring a sensor. The tag is made of an IC and an antenna. The IC will include memory and some form of processing capability. The memory may be read only or read/write, the type selected will depend on the application.

The Antenna

The Antenna receives the information from the Tag. The communication between the Tag and the Antenna is wireless, via radio waves and generally does not require line-of-sight. In some cases, facilities can use existing Wi-Fi Network antennas for the RFID System, eliminating the need to install RFID antennas. The antenna in a tag is the physical interface for the RF to be received and transmitted. Its construction varies depending on the tag itself and the frequency it operates on. Low frequency tags often use coils of wire, whereas high frequency tags are usually printed with conducting inks.

The Reader

The Reader sends information to a computer or network which houses interface software known as Middleware. Information is now available to users. Depending on the RFID system, the information could include: item's current location, where it has traveled, how much it has been used, environmental conditions it was exposed to and more.

Functions of the Readers:

a. To receive information from the Antennas and convert it to a usable format
b. To energize and control the Antennas

3. Operating techniques of RFID

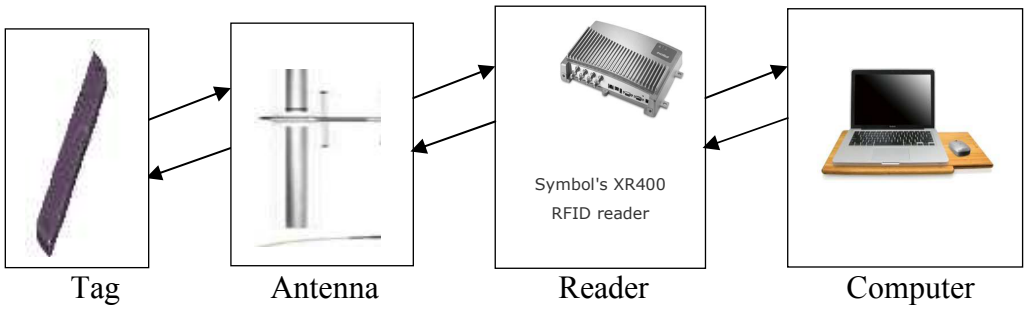

Figure 2. The basic schematic of all RFID systems

The tag talks to the interrogator (reader) using what is called the air-interface. This is a specification for how they talk to each other and includes the frequency of the carrier, the bit data rate, the method of encoding and any other parameters that may be needed. ISO 18000 is the standard for the air interface for item management. Also a part of this air interface is what is commonly called the anti-collision protocol (if the tag supports it). This is a means of allowing many tags in the field to talk "at the same time". There are several ways of doing this, and each manufacturer has developed their own way of implementing it.

Two other terms generally used are "Reader talks first" (RTF) and "Tag talks first" (TTF). With a RTF system, the tag just sits there, until it hears a request from the interrogator. This means that even though a tag may be illuminated (receiving power) from the interrogator, it does not talk until it is asked a question. With TTF the tag talks as soon as it gets power, or in the case of a battery assisted tag or active tag, it talks for short periods of time, all the time. This gives a much faster indication of a tag within sight of the interrogator, but it also means that the airwaves have constant traffic.

4.0 Implementing RFID systems in Nigeria.

There are numerous areas where this technology could be applied in Nigeria ranging from security, to supply chain management. The list is endless. However I will mention some of the areas for the purpose of this paper.

RFID in library Automation

With RFID technology, library Inventory can be fast and efficient. A whole shelf of books can be read by the reader. This can quickly help us to know which library materials are missing. Locating books also can be done on time with the help of a powerful reader which can access every books in the library at once. RFID can be used as a security measure in the libraries. As users are leaving the Library, the tags are read to ensure that items are properly checked out. Self-check systems have

become very popular in advance countries. RFID self-check systems allow registered users to check-in or check-out several books at a time. Self-check systems reduce the number of staff needed at the circulation desk.

RFID in Hospitals

RFID can be adopted in Hospitals in Nigeria both public and private with the goal of locating equipment when medical staff need them. This Will help medical staff, to spend less time looking for and gathering equipments especially in an emergency case. Such RFID systems are called "indoor positioning systems". Apart from this, public hospitals can use active RFIDs for patient and personnel identification and location purposes .This can help locate patients and read their information anywhere they are before administrating medications.

Toll Gates Fees Collection

Vehicles can be equipped with tags to make toll gate collection in Nigeria easier and improve traffic flow. In Nigeria today many people have lost their live in toll gates as a result of hazards which occur at the toll gates and which always involve many vehicles. So to make charging easier, RFID can be used to identify each vehicle passing through the toll gates and deductions of their charges are done automatically from their accounts based on the information stored in their tags. This will reduce traffic hold ups at the toll gates.

Vehicle Tracking

The rate of theft of vehicles is too much in Nigeria. (RFID) devices can assist in in the tracking of goods an vehicles. Tags work like a wireless plate. It transmits its identity to readers which are placed at strategic locations along the road like entry/exit of a premise, highway, weighing bridge, parking lots and others. Readers pick up these signals and transmit them to the centralized data servers from where the information can be viewed or utilized anywhere. The read-range of the reader varies from 5m to 30 m depending upon the technology (Passive Vs Active) in place.

RFID-embedded International ID cards

RFID can be embedded in international ID cards. This type of cards will be good instant identification of holders. This will reduce the time of information processing.

RFID in Inventory management

Automatic Inventory management system now uses RFID system where products in the inventory are attached with RFID. This enables proper keeping of records in the Inventory.

4. Conclusion

RFID systems are becoming ubiquitous systems that allow objects to be tracked without physical contact with the objects. This system has been found useful in so many areas of national development and security, such as vehicle tracking, supply chain management, library information systems, National ID cards, International Passports, hospitals management systems to mention but a few. Some of the systems are already in operation in developed countries such as America, Germany and United Kingdom. It is time Nigeria begin to tap into these resources for their national security, better hospital management, better toll gates management, and better stock and inventory management. The application of this technologies will cut short wasteful expenditures and enhance national security.

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