RFID- BASED PARTS TRACKING SYSTEM

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***Abstract*— Radio Frequency Identification (RFID) is the next generation wireless communication technology applicable to various areas. For the beneficial features of RFID, we integrate RFID readers into the Material Tracking Information System. Challenges experienced in the port and shortcomings of manual based tracking systems necessitated to explore use of modern methods to track transit cargo and various parts. Parts tracking includes application in Automobile industries, Animal husbandries, Children tracking in amusement parks, Supply chain management, Attendance systems etc. In this project it is explained how the RFID technology works and easily management can be done using RFID technology in tracking.**

Index Terms- RFID, EPC, Supply Chain Management.

I. INTRODUCTION

RFID tags are comprised of a tiny microchip which is attached to a small antenna. RFID leverages electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to identify objects over a distance of potentially several meters. Basic RFID tags can be as large as a 4x6" label or as small as quarter and usually cost anywhere from 10-cents to a dollar once integrated into an adhesive label or package. More advanced tags can have sensors and batteries attached to enhance their functionality and read range but are more costly. To read the tags, RFID readers emit radio signals that prompt all of the RFID tags within range to respond with their unique IDs in rapid sequence. The reader then passes this information on to be looked up in a local database to determine the product's identity. In many cases the unique ID stored on the tag is an Electronic Product Code (EPC). EPC numbers are passed to the EPC network which, in turn, will identify the product manufacturer, product type (SKU), and can provide updated tracking information.

RFID systems are employed to track shipments and manage supply-chains (e.g., Wal-Mart [2]) and to automate toll collection on highways, and are being deployed for many new application areas (e.g., passports, airline boarding passes, luggage tags, etc.)[2].

II. OVERVIEW

The application of RFID technology requires RFID tags attached to objects and an infrastructure for reading the tags and processing tag information. The infrastructure typically consists of antennas, readers (each typically controlling 1 to 4 antennas), and a back-end system with edge servers, application servers, and databases. An antenna employs RF signal to activate the tag, which then responds with its data, typically a unique 96 bit identification code and some asset related data. The reader collects the data and forwards it to the back-end system. The back-end system implements the logic and actions for when a tag is identified. The logic can be as simple as opening a door, setting off an alarm, updating a database, or complicated, such as an integrated management and monitoring for shipment tracking [5].

III. RELATED WORKS

RFID has generated widespread corporate interest as a means to improve supply chain performance. Market activity has been exploding since Wal-Mart's June 2003 announcement that its top 100 suppliers must be RFID-compliant by January 2005 [3]. Mandates from Wal-Mart and the Department of Defence are making many companies scramble to evaluate, select and implement solutions that will make them compliant with their customers' RFID requirements and additional retailers and other large supply chain channel masters are likely to follow suit. Vouldimos (2010) developed FARMA project which combined with RFID technology and mobile wireless networking to track animal and the data in repository which contains animal data records. The purposes of the system are to identify animal in case it gets lost and identify some basic information about particular animals [4]. A similar work done by Nor Suryani Bakeri et al. (2007) and Ahmad Rafiq Adenan et. al. (2006) developed a livestock monitoring system using RFID. Also work done by Kun Chen, Hanchung Tsai, Yung Liu, and Jim Shuler (2007) developed a parts tracking system for nuclear material management. An RFID tag is used and attached to each livestock to monitor its movement in and out as well as the basic information about any particular animals [1].

IV. METHODOLOGY

The method used to carry out this project is the principle of serial communication in collaboration with embedded

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systems. When parts come in front of RFID reader, the reader read the information about Parts from its unique RFID Tag and record into database basically it has three component antenna, transceiver and transponder. So these are components that perform the whole task .when a signal is sent by antenna it return back from the subject and the signal detected and by this the reorganization process is performed[4].

V. RFID RANGE

RFID range depends upon RF transmit power, the receiver sensitivity, the surroundings, how much water is present, the orientation of the tag, frequency of operation and the care that's gone into designing the products, planning and installing the system. Some RFID systems will only work over a few inches or centimetres while others may work over 100 meters (300 feet) or more.

TANSMIT POWER

Active tags have a battery, or an external power supply, so have enough power available to allow them to transmit *up to* the maximum legal power limit. The passive tag which is used doesn't have a battery. It needs to get the energy from somewhere**.** The answer lies in the RF energy that the reader transmits. If the tag and the reader are close enough, the tag's antenna can capture some of this RF energy certainly enough to enable the tag electronics to modulate the reflected signal with its ID number. The higher the transmit power the greater is the RFID range**.** But it's not possible to use as much power as required, to achieve the range require, or it can interfere with radio receivers that aren't even part of RFID system.

SENSITIVITY AND EFFICIENCY

The amount of power that the tag needs to get from the reader to enable it to operate is important. The electronics in a passive tag is usually simple and it doesn't need to draw a lot of energy from the reader's RF field to operate. The working distance between a reader and a passive tag is greatest when they are in tune. The more closely the RFID tag is 'tuned' to the reader frequency, the stronger is the signal.

ANTENNA

Both a reader and a tag have an antenna. To enable data communications each must be able to receive some of the transmitted RF energy from the other so the information can be recovered, from the RF carrier, and used. A simple whip antenna radiates RF energy in most directions, similar to the way a light bulb radiates light energy in most directions. But some types of antenna focus the radiation into a beam. Any other radio receiver within the influence of this concentrated beam might also be influenced adversely. An intensely focused RF transmission from far away might overpower a weaker local RF signal.

FREQUENCY

Here are the four most common Radio Frequency bands for RFID...

- Low Frequency (LF) 125 to 134 KHz band
- High Frequency (HF) 13.56 MHz
- Ultra High Frequency (UHF) 433 MHZ and 860 to 956 MHz band
- Microwave Frequency 2.45 to 5.8 GHz band

In general, the higher the frequency, the greater is the range of .RF radiation has more energy at the higher frequencies and so the RF field can influence RFID tags that are further away. Lower frequencies (LF) usually mean shorter RFID range**.** LF RFID devices use the so-called Near Field Effect. This uses the magnetic component of the electromagnetic energy and this couples the tag and reader over only very short distances of typically up to half a meter, or just over a foot. This is fine in applications like card readers where you bring the tag up close to the reader. But the influence falls off very rapidly as you move the tag away from the reader.

If the separation distance doubles, the RF intensity falls, not to half of what it was, but to one eighth. If the separation distance is tripled, the RF intensity falls to one twenty-seventh of what it was. This effect limits the amount of power that can be transferred from the reader to the tag as they move further apart. This is significant if the tag doesn't have a battery and is relying on harvesting some of the radiated energy from the reader to power its microchip.

SURROUNDINGS

Liquids such as water can absorb RF (especially at microwave frequencies) and metals can shield or reflect RF energy**.** Some tags are designed to minimize the effects caused by RF reflections, by processing the reflected signals that arrive at slightly different times, because some take slightly longer paths than others and take longer to get to the receiver.

TAG ORIENTATION

Other things kept aside, range is best when tag orientation is best**.** For example, in a factory it's often easy to mount a reader under a conveyor so that it always faces tagged items that are in a fixed position when passing over the reader. RFID range is worst when the tag is edge-on to the reader**.** This is because the RF is weakest when edge-on. Imagine you have a pile of randomly mixed tagged items [6].

VI. ARCHITECTURE

With every given RFID tag, a system is required to read given RFID tags in order to identify the tagged objects and track its movements as they are moved from one location to another in an environment. The system should comprise a network of RFID readers deployed across the environment. Fig 2 shows the networked RFID system architecture which compromises RFID tags, readers, and middleware, database, track and trace applications. RFID readers can be successfully deployed in various strategic locations in environment including exit and entrance points, checkout points, shelves, path, shelves and open areas [3].

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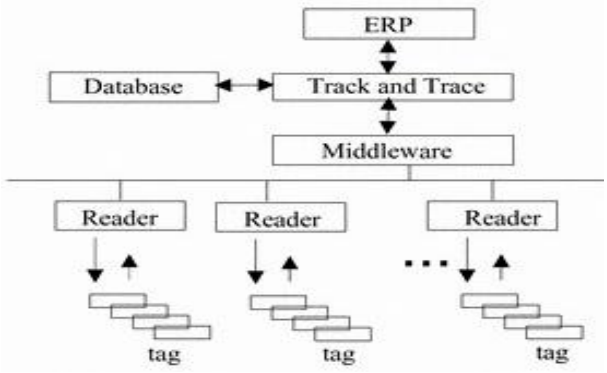

Fig No. 2 Architecture of RFID System

VII. CONCLUSION

Radio frequency identification (RFID) technology has been in use for several decades to track and identify goods, assets and even living things. Recently, however, RFID has generated widespread corporate interest as a means to improve supply chain performance. Market activity has been exploding since Wal-Mart's June 2003 announcement that its top 100 suppliers must be RFID-compliant by January 2005. Mandates from Wal-Mart and the Department of Defense are making many companies scramble to evaluate, select and implement solutions that will make them compliant with their customers' RFID requirements and additional retailers and other large supply chain channel masters are likely to follow suit [5].

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