

An Insight on RFID technology and Future challenges

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ABSTRACT

With RFID it is possible to orient machines to recognize objects and communicate with them if needed. Progress in Wireless sensor technologies have made it possible for humans to interact with machines like never before. With nanotechnology making huge foray in technology more and more of power is being packed in lesser and lesser of space and has thus allowed development of RFID based system that connects and enables intelligent interaction between objects around the world. This paper tries to present an insight on RFID technology and its usage.

Keywords: RFID; Data Capture (AIDC), Enterprise Information Systems (EIS).

I. INTRODUCTION

Radio Frequency Identification (RFID), a wireless Automatic Identification and Data Capture (AIDC) technology has caught up in the present times and has now become quite common. Logistics industry is quite open to the possibilities of RFID coming as a great benefactor as far as inventory management is concerned [1] [2] [3]. Explosion of sales from electronic commerce has added upto its requirement. Real-time tracking of items in the Supply Chain (SC), using RFID technology, is turning out to be of great benefit and has potential to be the game. In the near future, RFID technology is fast moving out to be a universal will be universal for tracking items, products, animals, shipments and even humans.

The RFID development community had perceived the idea of Internet of Things to refer to the possibility of discovering information about a tagged object by browsing an Internet address or database entry that corresponds to a particular RFID tag. RFID has fundamentally renovated the way information about products, equipment, animals and even people is collected and processed in real time, providing new business opportunities. RFID technology provides an

opportunity to the organization to reframe its business models so as to optimize the work process and improve efficiency and thus helping the company to reduce cost and accelerate production. Companies that implement the appropriate business processes to leverage the data collected by RFID and its conversion to information and intelligence will accelerate its benefits. RFID technology continues to evolve as it is applied to more processes especially in the day-to-day operation of things and thus, taking the notion of the IoT closer to reality. This paper is divided into 5 sections. Section I is the introduction. Section II provides a literature review of RFID IoT enabling technologies and applications. Section III will discuss the issues in RFID usage. Section IV deal with the research and development needed to move forward from RFID to IoT and concludes in. This paper will conclude in Section V by analysing current efforts and future roadmaps to make the Internet of Things a reality.

II. LITERATURE REVIEW

In the present time the business houses, organization, industries are pushing it hard to survive in this competitive market and are always in search of

opportunities to keep themselves abreast of the current technologies and to exploit them for giving them a competitive edge. The internet has opened plethora of opportunities and with advances in sensor technologies, miniaturization and nanotechnology things have quickly moved to an area of embedded or artificial intelligence. These technologies have created opportunities for embedding intelligence in objects and have led to development of smart objects [7][8][9] that can autonomously communicate with each other. RFID has introduced a new way of doing business by converging computing, communications, and interactivity are available through a world of wireless, sensors, and network computing [11][12]. RFID can supplement machines with intelligence to identify objects, undermine their status and communicate with them as and when required in real time [13][14]. Identification technologies such as RFID, wireless sensor technologies allow objects to provide information about their environment and context, smart technologies have moved a notch up by allowing the everyday objects to “think and interact,” nanotechnology and energy-scavenging technologies are proving fuel to the notion of more processing power into less space [19]. These developments have heralded the idea of “Internet of Things” (IoT) that connects and enables intelligent interaction between objects around the world [15][16]. The present day researchers have coined the phrase “Internet of Things” referring to the the general idea of a thing being connected and controlled through internet either by using RFID, wireless LAN, wide-area network, or other means [17]. Developments are being carried out at a very fast pace with embedding of short-range mobile transceivers into a wide array of additional gadgets and everyday items, enabling new forms of communication between people and things, and between things themselves creating new dimension having anytime connectivity with any thing.

RFID has allowed each object to have its own identifier that can be read at a distance allowing automatic, real time identification and tracking of individual objects [19]. Literature give evidence of lots of approach being followed to achieve the “Internet of Things” and RFID has a major bearing on it being named so. With the advent of electronic commerce the RFID has come as a solace for the logistical overload problem [21]. The passive RFID tag present itself as a cheap, small device having an infinite shelf life and capability to work efficiently in a wifi scenario without interferences making it redily convenient for business[22][23]. As businesses have achieved a global presence the RFID has matched to the requirement as was required and has become irreplaceable. The scope of RFID technology applications has also expanded to include not just manufacturing but also other industries like in retail industry as electronic article surveillance [24], cashless payment from credit cards (Smart cards) [25][26], transportation management [27], public transportation tickets (Smart cards) [28][29][30] and parking services (Smart cards) [31] to consumer devices (such as EZpass and Speedpass), healthcare (tracking items, drugs and patients) [32][33] and e-government (such as e-driver’s license and ePassport) [34]. As more and more everyday things are RFID tagged, the RFID object technology features - readable, recognizable, locatable, addressable, and/or controllable via the Internet – extend to these things. Researchers are focusing on arming the RFID tag with more memory and thus allowing more advanced artificial intelligence features can be embedded in the tag leading to more refined systems

III. RFID USAGE ISSUES

As discussed above though the RFID has established itself an irreplaceable technology it does faces comes serious challenges. These challenges are in terms of its potential to generate large amount and the discrepancy in the collection of data of data. The management concern is to segregate, organize and

store the relevant data to prevent the system from overloading. In order that the system are streamlined the businesses should take efforts in integrating the RFID with the ERP application that are being used.

For RFID to be optimized there is need to exploit it in combination of the supply chain wherein it creates a conducive atmosphere for creating and sharing detailed RFID information. The IT system of the organization have to be buckled up to accommodate RFID by allowing process reengineering in three areas: package, business site and network [34]. One major threat to the RFID is the air interface. Host of researchers have discussed the potential problems being face by the RFID based systems [22][32][35][36]. With increased RFID integration with the business chain ,problem of the privacy have surfaced [37][38]. EPC global have presented certain guidelines which address to privacy concerns but have not been able to fully address it specifically – personal and location privacy. Options like : killing a tag (which can be executed with a 32-bit PIN) by disabling it at the point-of-sale counter, temporarily disabling a tag (putting a tag to sleep) then transmitting a PIN to awoken it, changing the tag identifier over time, relabeling tags, cryptographic approach , and interference prevention techniques are being put to use to address the privacy issues [36]. RFID should be able to support data sharing and transfer between different locations/organizations that are partners in the SC.

An RFID system will have several interacting entities: such as Objects – all EPC-tagged objects, such as cases, pallets and trucks; Readers – which are tagged with EPC code; Locations – used to represent where an object is and is also associated with a owner; and Transactions – business transaction in which EPC is involved e.g. check-out [40]. For the products moving from one place to another the dynamics provide a set of new challenges toward reading and tracking of data.

RFID management system deals ‘object tracking “ and “Object Monitoring” and has to keep track of missing objects too proving a new set of challenges and is quite complicated [40]. As RFID technology continues to evolve, more features will be added to the system. At the same time, more vulnerabilities/threats will be discovered; however, this will drive the RFID researchers to come up with enhanced designs to mitigate the security and privacy risks.

IV. FROM RFID TO THE INTERNET OF THINGS

The transition from the internet of computer to internet of things has changed the way things or objects were working and has resulted in fusion of the real physical world with the virtual world .Digital objects in a virtual world now represent physical things. Objects are now context-aware. They can sense, communicate and interact autonomously. The IoT is leading to a new arena of applications and services with higher productivity [43]. The key features of the IoT includes: ability to manage centralized or decentralized applications ; identity management of variety of identifiers ; context aware applications; mobility of people or things; different quality of service for different types of services and customized, personalized and user-friendly applications [44].

IoT has heralded a new trajectory of internet application and has opened opportunities for innovation in services relying on information related to the identity, status and location of the things (objects), and new societal services that will improve the quality of life [19]. RFID technology has a big big role to play as far as IoT is concerned subject to the air interface problem mitigation and the problem in discovering an object .Similarly there is need to standardize RFID systems related to physical objects (readers, tags, and sensors), communication infrastructures, spectrum for RFID use and security and privacy issues [45]. For the IoT, the futuristic

sensors and actuators will be intelligent and will modify the network like never before.[19]. The current EPCglobal infrastructure has not been fully tested yet and it need to chalk out plans and measures to cope of with the futuristic developments .

Development in RFID tags would be in two direction ,one for developing a cheap tag and other to develop a very sophisticated tag with lot of functionality being incorporated on it. There will be a need to develop protocols that are clever and use a minimal amount of power [19]. The future pervasiveness of the IPv6 protocol is expected to enhance the security of the object communication through the Internet. Thus, RFID technology is still some ways away from fulfilling its promise as a pivotal enabler of IoT.

V. CURRENT EFFORTS AND FUTURE ROADMAPS

IoT has put to life the idea of anytime, anyplace and anything along with the RFID infrastructure and issues highlighted in the section above. Some challenges include: 1. Ability of network to cope with object explosion ? 2. Governance of global IoT? Data Control ? 3. Integration of inter-organizational? Data format? Data compression ? 4. Business models ? 5. Privacy concerns? 6. Interaction Mechanism ? 7. Object addressing ? How can objects discover services or applications?

Researchers have employed themselves in different area of concerns . The European Union is actively funding research through the Cluster of European Research Projects on the Internet of Things (CERP-IoT) including research in RFID technology (see http://ec.europa.eu/information_society/policy/rfid/index_en.htm and <http://www.rfid-in-action.eu/cerp>) to address these issues. Researchers at the Auto-ID labs network (<http://www.autoidlabs.org>) are also working on some of these issues. Thus, for RFID

technology to meet the expectation it need to plug in the gaps as mentioned above and it has the capability to present itself as a technology which is able to find solutions or schemes that will bring benefits and yet protect the consumer's security and privacy.

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