RFID and WSN are most researched and rapidly emerging technology which provides wide range of applications and huge number of future potentials. RFID sensor technology is useful for tracking very large volumes of items with specific identifiability in a cost effective way. RFID is used to find the occurrence and location of the object and WSN is used to sense and monitor the surroundings. This paper is mainly discussed about RFID, integration of WSN and RFID, WSN, integrating RFID tags with WSN and applications.

Keywords: RFID, WSN, RFID tags, Integration of WSN with RFID

I. Introduction

There has been a rapid growth on developing and applying RFID technologies in industries, research communities have paid less attention to the integration of RFID and WSNs. It is now well recognized that future internet will not only connect people and data but also objects. This paper survey is on recent research works, new products and applications that integrate RFID with wireless sensor networks. This sensor network is used to sense the data and also used to collect the information which can be transmitted about their surrounding environment. When RFID is combined with more sophisticated sensors then it transmits the real-time information. Components of RFID technology are the tags, readers and host computer. Wireless Sensor Networks have originated as a vital new area in wireless technology. Initially Sensor Networks were developed only for military applications such as battlefield monitoring and have been successfully retreated for patient monitoring. If wireless sensors are operated in ad-hoc environments then it leads to unreliable and regular network failures. Failures are not tolerable in a healthcare setting because critical data about the patient is being transmitted. For more reliable network, Wireless Mesh Network which is an extension of Local Area Networks is proposed. Mesh network have a far better range and use only limited number of cabling. WMN enables the sensing of vital information emerging from wireless sensors connected to the backbone network which creates wireless sensor Mesh Network which is an integration of wireless sensors and mesh networks and provide different functionalities to improve the monitoring of the environment where the network is deployed. All WSNs are controlled by software which implements the different routing protocols used by the network RFID tags consist of an integrated circuit (IC) attached to an antenna typically a small coil of wires plus some protective packaging (like a plastic card) as determined by the application requirements. RFID tags are either active which is also called as self powered by a battery or passive which is also called as no battery. Tags also sometimes are called "transponders," and sometimes they are called "inlays," although technically an inlay is a tag mounted on a substrate that is ready to be converted into a smart label. RFID tags can come in many forms and sizes. Some can be as small as a grain of rice. Data is stored in the IC and transmitted through the antenna to a reader. Tags also can be read-only, read/write and the stored data can be rewritten or altered and a combination, in which some data is permanently stored while other memory is left accessible for later encoding and updates. RFID communication is fast, convenient, and its application can substantially save time, improve services, reduce labor cost, thwart product counterfeiting and theft, increase productivity gains, and maintain quality standards. Common applications range from highway toll collection, supply chain management, public transportation, controlling building access, animal tracking, developing smart home appliances, and remote keyless entry for automobiles to locating children. The RFID tag stores the information of the patients, RFID reader reads information on the tag and RFID software helps in processing and collection of data. This paper gives an overview of WSN and RFID Technology and their applications, which is as follows: Section 2 and 3 discusses about WSN and RFID, section 4 and 5 discusses about Tags integrating with WSN and Integration of RFID and WSN, section 6 discusses...
futures and challenges, section 7 discusses concluding remarks.

II. Radio Frequency Identification

Radio Frequency Identification (RFID) technology is a recent sensor technology, which stores and retrieves the data and allows tags to be read from a distance with the use of a wireless sensor reader. RFID sensor technology is useful for tracking very large volumes of items with specific identifiability in a cost effective way. When combined with more sophisticated sensors transmitting real-time information and internet-enabled web services, this allows real-time connectivity and tracking of information about a wide variety of objects in daily life. One of the differences between RFID and bar code technology is RFID eliminates the need for line-of-sight reading that bar coding depends on. RFID has been widely used in retail stock management, supply chain tracking, toll collection, tracking library books, parking access control, airline luggage tracking, and electronic security key and healthcare. RFID systems consist of two main components: tags and readers. A tag has an identification (ID) number and a memory that stores additional data such as, product type, such as temperature, humidity, manufacturer and environmental factors. The reader is able to read and/or write data to tags via wireless transmissions. RFID is similar to bar code technology but uses radio waves to capture data from tags, rather than optically scanning the bar codes on a label. RFID does not require the tag or label to be seen to read its stored data that’s one of the key characteristics of an RFID system.

III. Wireless Sensor Network

Wireless Sensor Networks (WSNs) consist of numerous sensor nodes which can be used in many new emerging applications like healthcare. WSN is also widely applied in many areas, such as traffic surveillance, industry manufacturing, environment monitoring and distributed robotics. WSNs are mainly used to monitor environmental conditions, such as pressure, vibration, sound and pressure. The sensor network is composed of large number of sensor nodes that can be deployed on the ground, in the vehicle, inside the building and in air. WSN is one of the most rapidly evolving R&D field for microelectronics. WSN is one of the most rapidly evolving R&D field for microelectronics. The Sensor Node comprises of computing, sensing and communication elements. Wireless sensor networks consist of three basic topologies: star topology, mesh topology and point to point topology. A WSN is a collection of nodes. Each node consists of processing capability and may contain multiple types of memory: data, flash and program memories. Each memory have a RF transceiver to have a power source and accommodate various sensors and actuators. Sensor nodes have only a limited transmission range. WSN are either range- free or range-based. It utilizes a component-based architecture that enables rapid implementation and innovation while minimizing code size as required by the memory constraints in sensor networks.

IV. Integration of RFID AND WSN

Radio Frequency Identification (RFID) and Wireless Sensor Network (WSN) are two important wireless technologies that have wide variety of applications and provide limitless future potentials. Integration of RFID and WSN can provide RFID to work in multihop to extend the application of RFID to operate in a wider area. The integrated WSN node consists of an RF transceiver, RFID reader and micro-controller which coordinate different components in the node. RFID communication is fast, convenient, and its application can improve services, substantially save time, reduce labour cost, thwart product counterfeiting and theft, maintain quality standards and increase productivity gains. RFID systems are mainly used to identify the objects and to track their location without providing any indication about the physical condition of the object. WSN are small, cost-effective devices that can cooperate to gather and provide information by sensing environmental conditions such as pressure, humidity, sound, light and temperature. And WSNs also provide cost-effective monitoring of critical applications including environmental monitoring, border monitoring, industrial control, home applications, healthcare and military applications. The integration of RFID and WSN technology will give new perspectives to a broad range of useful applications, bridge the gap between the real and the research/academic world and maximize their effectiveness. This is because the resulting integrated technology will have reduced unnecessary costs, extended capabilities, as well as scalability and portability. RFID technology has received extended thoughtfulness and it has been utilize extensively in industrial applications. And the wireless sensor networks have the focal point of huge research activity but they have concept only with the main exception of their adoption in aggressive applications. There are many applications where the identity or the location of an object is not sufficient and extra information that can be retrieved through sensing environmental conditions is important. The evolution of RFID and WSNs has followed separate research and development paths and has led to distinct technologies although sensor networks
may be used in these environments as well, the location and identity of an object remain critical information that can be retrieved through RFID systems. The best result in these cases is the integration of both technologies because they complement each other.

V. Integration of RFID tags with WSN

Combining RFID reader enabled cell phones and RFID sensor tags in a cellular network or the Internet, the consumers will be able to read any RFID sensor tag in almost any application. Information of RFID tag can be downloaded to cell phone from a remote database for some applications. Integrated RFID tags with sensors or sensor-tags, as we are going to refer to them from now on, can be discriminated into two main categories: integrated sensor-tags that are able to communicate only with RFID readers and integrated sensor-tags that are able to communicate with each other and form a cooperative ad hoc network. In this section, we will provide the main features of these two categories of integrated sensor-tags and we will also present an overview of the available research and commercial proposals for each category. Integrated sensor-tags that are able to communicate only with RFID readers can be considered as RFID tags with some additional sensing capabilities but with limited communicating capabilities. However, it is possible to integrate sensor nodes with RFID tags so that the integrated sensor-tags will be able to communicate with each other as well as with other wireless devices. Thus, this category includes the integrated sensor-tags that exceed the limitations of possible communication only with an RFID reader and are able to communicate with each other through a cooperative ad hoc network. Sensors will result in an explosive increase in data flows when networks become more ubiquitous. This increase in the number of sensors operating around us will result in an exposition. This will be the area of concern and also a number of new data mining tools would be required to be developed, which will help us in extraction of relevant information from the voluminous data.

VI. Applications

Banking

Banks can provide their customers with cards integrated with RFID tags. RFID reader integrated mobile phones can be used to read the RFID banking card. This can allow the customer to purchase things wirelessly. The card will be read using RFID reader integrated mobile phones as shown in Fig.8. This ID information will be sent to mobile phone communication service provider, so that it can be used for further transaction or processing. Banks will provide every

RFID card with a pin code. The user will be required to enter this code for every transaction using the RFID banking card. This pin code system will prevent people having RFID reader integrated mobile phones to read other people’s RFID banking card.

Health care

Sensor networks can track patients, doctors, and medical instruments, monitor patient’s physiological data and control the drug administration, track and monitor inside the hospital. This type of monitoring helps in detecting abnormal situation where the computer can alert the concerned medical personal. The medical sensor network system normally integrates heterogeneous devices, some wearable on the patient and some placed inside the patient’s room. This includes oriental sensor, dust sensor pressure sensor, environmental sensor, RFID tags and floor sensor.

Animal tracking

RFID tags can be used to track animals. For many years Implantable RFID tags have been used for tracking livestock.

Hospitals

RFID can remarkably benefit hospitals. In hospitals RFID can be used to tag medicines, syrups and drugs which can prevent misshapen in hospitals.

Military

RFID has been used in military operations from a long time. RFID were initially used for aircraft identification and can be used for other military purposes.

Library

In large libraries books can be tagged for easy management. When issuing a book librarian can just use a reader and it can send an entry to the computer about the books ID.

Asset tracking

Smart RFID active tags can track the assets. Hybrid systems can be made in which RFID system is coupled with enterprise and wireless systems to monitor products, gather information and transfer data from mobile repositories inside and outside a particular zone in time intervals accurately.
VII. Conclusion

This paper proposed a technique for the integration of RFID and WSN which is an unavoidable step to acquire an high level of technological advances. These integrated networks will extend traditional RFID systems and will give us an important advantage in controlling environments and industrial processes. This integration will give us the advantage not only to reveal an item’s location and identity but also its current state. However more effort is needed to achieve efficient integration of RFID and WSN.

VIII. References


