A Review on Efficient Data Collection for Large-Scale Mobile Monitoring Applications Using HRW

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***Abstract*- A system made up of large number of low-cost micro-sensors contributes to Radio frequency identification (RFID) and Wireless sensor network (WSN). By using this network we can store and transmit the information to a base station (BS). It is a combination of number of nodes which means that we have required energy efficient routing protocol which should be suitable for a long-life work time. We can get better performance by decreasing energy consumption as well as load balancing of WS. There are many protocols which are fibular with data collection and transmission which are such as LEACH, HEED, PEGASIS, TBC and PEDAP. RFID and WSNs are also fibular with identification and transmission of data, respectively, and hence which is suitable to use in the applications of health monitoring and environmental monitoring. The collectively use of a sensor and an RFID tag used to collect RFID tag information and sensed information, respectively. The number of research are done on the integration of RFID and WSN to enhance the performance of monitoring applications, In this paper, proposed system is a hybrid RFID and WSN system (HRW) that is the general combination of RFID system and WSN system for efficient data collection to observe the wireless monitoring application in the absence of persons those involve in monitoring, at current places they can monitor the things without losing lot of effort required to handle the each particular place which is connected in WSN. The collection of hybrid smart nodes that combine the reduced function of RFID readers, function of RFID tags and also wireless sensors which are collectively creates the HRW system. In this system each nodes can read each other's The sensed data in tags, can be read by each node and can be transmitted quickly to an RFID reader via the node that first come in the range of it. This data finally transmitted to the back-end server for the purpose data processing and managing. The proposed methods to protect data privacy and to improve data transmission efficiency and to avoid malicious data have selective forwarding in data transmission.**

***Keywords*-Radio frequency identification (RFID), wireless sensor networks (WSNs), distributed hash tables (DHTs), data routing.**

I. INTRODUCTION

Wireless sensor network (WSN) is a composed system with a large number of low-cost micro-sensors. This system is used to gather and send various kinds of messages and information to a base station (BS). WSN consists number of nodes that is low-cost with imperfect battery power, and the battery replacement is not easy for WSN with thousands of physically entrenched nodes, which means energy effectual routing protocol should be employed to offer a long-life work time. RECENT advances in wireless communication systems and digital electronics have enabled the development of low–cost, low–power, multi–functional sensors nodes that are not large in size and communicate unstrapped over short distances. To achieve the aim, we need not only to reduce total energy consumption but also to handling the WSN load. Researchers have proposed many protocols such as LEACH, HEED, PEGASIS, TBC and PEDAP. WSNs are mainly used for monitoring physical or environmental condition, collecting environmental data such as temperature, sound. RFID is a technology that uses radio waves to transfer data among RFID tags and RFID readers. RFID can be implemented on the objects identified and to improve the efficiency of individual object that are to be track and manage. More than 104 Wal-Mart stores have installed RFID systems to keep monitoring the stock levels and track marketers in the supply chain [1] so that the products will not be out of stock or lost.

II. LITERATURE SURVEY

RFID tag data usually is collected using direct transmission mode, in which an RFID reader communicates with a tag only when the tag travels into its transmission range. If many tags move to a reader at the same time, they will struggle to access the channels for information transmission. Normally, the percentage of tags that can success fully transmit their data in one transmission is just 34.6 percent to 36.8 percent [2]. Such transmission architecture for RFID data collection is not adequate to meet the requirements of low economic cost, high performance and real time individual monitoring in large-scale mobile monitoring applications.

A. Cost Related To Economic

The overall information cannot quickly reached to each and every of an RFID reader from tags cause of its enough moving rate and short transmission range. Thus, the numerous RFID readers is required to increase their range for fast data collection.[15,16,19] This would cause significant cost of the system temper involving the high price of a high-quality RFID reader (at least $400-$600) and the high cost to established connections between back-end servers and RFID readers. Thus, it is necessary to install the number of RFID readers to achieve efficient data collection.

B. Highly rate of performance

In general RFID monitoring applications, the reader is need to rapidly manage several tags at different distances at the same time, such type of application is that supply chain management and baggage checking in Delta Airlines. An RFID reader can only read tags in its range, due to limited communication bandwidth, background noise, multi-path fading and channel accessing continuation between tags, would may be cause the poorer performance of the data collection. These problems can be reduced by using transmitting data in short distances via the multipath data transmission mode in WSNs.

C. Real-time individual monitoring

In applications that require real-time monitoring on particular objects (e.g., in real-time monitoring system that has the capability to monitor physiological parameters from multiple patient body. In this system, a coordinator node has attached on patient body to collect the information in the form of signals by using sensors and sends them to the base station.[20] The attached sensors on patient's body form a wireless body sensor network (WBSN) and they are able to sense or capture the information related to body such as the heart rate, blood pressure and so on. This system can detect the abnormal conditions and send a SMS/E-mail to the physician.), retrieval of individual objects is most necessary. But it is require the number of sensors and RFID tag which is too much affected on no of factor. [20] Though the integration of a sensor and an RFID tag helps to gather both RFID tag and sensed information from objects, rapidly collecting the information still it is a big challenge to handle it.

III. COMPARATIVE STUDY AMONG VARIOUS DATA COLLECTION METHODS

The communication efficiency can be improved by multi-hop message transmission mode in HRW. However, such method introduces security and privacy risks. Low-cost RFID nodes are not capable to large coverage and can be deployed in open environment, thus the intruders can easily physically entrance and take control of these nodes. The intruders can collect all the information in the negotiated nodes and use the negotiated nodes to obtain sensitive information and can disturb system functions. Thus, in this section, we consider two security threats arising from node Compromise attacks data manipulation and data selective forwarding.

In this paper, in this paper the proposed technology is a Hybrid RFID and WSN system (HRW) that has a broadly integrates the RFID and WSN data transmission modes for efficient data collection in large-scale monitoring applications (e.g., environmental and health monitoring) abbreviated as HRW. Impose the integration to reduce the numerous requirement of RFID readers hence economic cost and improve the data transmission efficiency. The new types of nodes used by HRW called Hybrid Smart Nodes (smart nodes/nodes in short) that has combine function of RFID tags, and reduced function RFID readers with sensors in wireless sensor network. The system mainly consists of three components: RFID readers, smart nodes, and the back-end server infrastructure. The RFID readers collect data from smart nodes and transmit the data to the infrastructure. The summarize contribution of this paper is as below.

A. Active data transmission

Inspired by the multi-hop transmission mode in WSNs, rather than passively waiting for RFID readers to read data, data is actively transmitted by smart node to readers in a multi-hop manner. Smart nodes read tag data between each other. In this way, beside of reading each and every tag one by one when they move into the reading range, RFID reader can receive the information in the form of a bunch from group of tags by reading only one first-come across node. As a result, the channel contention and noise interference can be reduced significantly while data exchanging. In the traditional WSN, a node in the sleeping mode cannot involve such type of activities like receiving and forwarding data. In HRW, a node can read data from the RFID tag of another node even if it is in sleep mode, which greatly increases transmission efficiency.[11]

B. Algorithms to enhance efficiency

The further improvement of information collection efficiency by letting cluster nodes replicates their data to each other or to one specified cluster head that has high encountering frequency with cluster nodes and RFID readers. We also propose a tag clean-up algorithm to remove delivered data from tags to reduce transmission overhead.

C. Security strategies

In the proposed system to handle efficient data transmission two security threats are used to enhance privacy and security risks. First one is selective data forwarding and second one is data cleaning algorithm which clean the unnecessary data which is not long needed.

The widespread imitation and trace-driven experimental results show that the number of RFID readers can be reduces by using HRW.[9,10] The transmission delay of each node, and the demand on the capacity of tags, compared to the general RFID monitoring system. The effectiveness of proposed algorithms is also shows by results to enhance the efficiency and security. In this paper the proposed system work to improve or to enhance the performance of HRW with cluster-based data transmission in such a way of cloud computing and also implemented some security mechanisms.

IV. COMPONENT OF HYBRID RFID AND WSN SYSTEM (HRW)

Smart node is a part of HRW which is typically made up with the following components.

- Sensors: Sensor is device which is used to sense the information and data and has transmission function. But the sensors used in this system not has any transmission function it is used to gathered only sensed data and environmental data (e.g., pressure, temperature) from hosts and RFID tag. As the normal RFID tag.
- Tags: An RFID tag is included of an integrated circuit (called an IC or chip) joined to an antenna that has been

printed, engraved, stamped or vapor-deposited onto a mount which is often a paper substrate or PolyEthylene Therephtalate (PET). The combination of chip and antenna is called an inlay, is then converted or inserted between a printed label and its adhesive backing or inserted into a durable structure.

Figure1:RFID tag.

- Tag's chip :The tag's chip or integrated circuit (IC) delivers enactment, memory and extended features to the tag. The chip is pre-programmed with a tag identifier (TID), a unique serial number is assigned by chip manufacturer and includes a memory bank to store the items' unique tracking identifier (called an electronic product code or EPC).

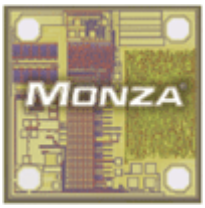

Figure2: Tag's chip

- Tag antennas: tag antenna used to collect energy and channel it to the chip to turn it on. The energy collection is depending on the ranging area off antenna and it will be able to gather data and channel toward the tag chip, and the further read range the tag will have. There is no perfect antenna for all uses. It is the application that defines the antenna specifications. To enhanced the particular frequency band some tag are used while others might be used for moral performance when attached to materials that may not work properly for wireless communication (certain fluids and metals, for example). Antennas can be made mad up with the variety of materials; they can be printed, stamped, with conductive ink, or even ether deposited onto labels. Tag with multiple antennas are more reliable than tag with single antenna, a tag's orientation can result due to areas on the tag where incoming signals cannot be easily reaped to provide sufficient energy to power on or off the chip and communication occur between RFID reader and tag chip. A tag with dual antennas is able to remove these dead zones and increase its readability but requires a particular chip.

Figure3:RFID antenna.

- Reduced-function RFID reader (RFRR). An RFID reader, also known as an intermediation, is a device that provides the link between the tag data and the initiative system software that needs the information. The reader communicates with tags that are within its field of operation, performing any number of jobs including simple continuous inventorying, clarifying (searching for tags that meet certain criteria), writing (or encoding) to select tags, etc. The reader captures data from tags by using antenna. Then this data passes to the back end server for processing. Just like RFID tags, there are numerous different sizes and types of RFID readers. Readers can be fixed in a static position in a store or factory, or incorporated in a mobile device such as a portable, handheld scanner. Readers can also be fixed in electronic equipment or devices, and in vehicles.

Figure4: RFID antenna

A cloud computing playing a vital role in environment of mobile presence services, it is a part of social network. Current information tells the detail about mobile user's disposal, movement and machine volume. Service does tracking of user id to his/her current presence information or details. Each individual mobile user has a companion list in which presence the details of that user whom he/she wants to interact within social network services. When a user moves from one level to other level, this change is naturally transmitted to each individual on the companion list.

Server cluster technology decrease the report time and increases the search speed. For example mobile the mobile presence services searches and reveals each of them about user's friend list like a instant messaging system whenever user logs in through his/her mobile device [2]. Architecture of existence cloud which is the proposed work is shown in Figure1, Mobile user access the internet by Using 3G or Wi-Fi services and make a data link to the existence cloud. Mobile users are intent to one of the presence servers by using secure hash algorithm. In existing cloud system once the path is set up, the mobile user can request for the friend list to the existing server which is present in current cloud. And eventually the request is responded by the existence cloud after

finishing an efficient search of companion's presence information.

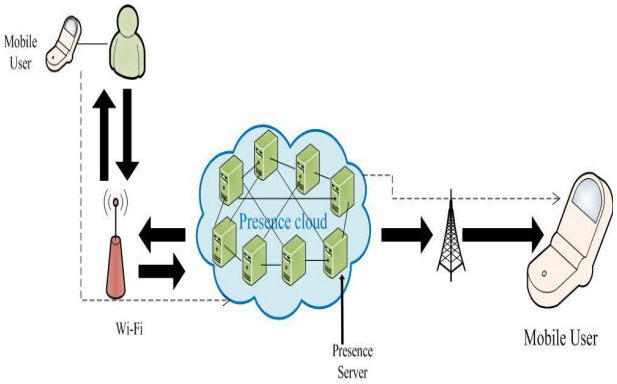

Figure 5. Presence Cloud Architecture

The working process of HRW system is as, RFRR with a simple ultra-high frequency reader module from usual RFID readers. An RFID reader module can be low cost as $29, which are cheapest costs than a high-quality RFID reader (at least $400-$600). Using RFRR, nodes can exchange their tag data in a foresight manner. RFRR also support to store the sensed data from monitored hosts and environment into the tags. The smart nodes are reasonable to creates network as they consist of simpler and partial parts from nodes integrating RFID tag and sensor tasks and RFRR functions. Compared to high cost RFID tags, HRW can provide higher performance at the low cost instead of additional components of reduced-function sensor and RFRR for each node. The nodes integrated with RFID tag and sensor functions and also efficient data collection with RFRR modules is done by using HRW. Each smart node has two modes: sleep mode and active mode. In the active mode, the physical information can be collected by sensor in active mode by smart node host and asks RFRR to write the data into the node's tag chip. While in the sleep mode, smart nodes in client mode means do nothing and the tag information in a node can be read by other active nodes; no matter it is in sleep mode. Since there is number of smart nodes in the system, and impact can be exist in the transmission of the collected information to RFID readers is delay tolerant, it is not necessary for all smart nodes to should active at all, which may be cause of consuming considerable battery power.

Fig. 6 shows the general RFID architecture, and Fig. 7 represents the architecture of the HRW system. Both architectures are hierarchical. The outer layer is grouping of RFID readers connected to the back-end arrangement with high-speed backbone cables. The back-end arrangement connects to the wireless monitoring applications (e.g., database in a hospital). The considerable number of object hosts formed the lower layer that sends data to RFID readers. The difference between these two architectures is the transmission mode.in first architecture the data is directly sent to central RFID reader but in second architecture the data are transferred among the number of node then transmit to the minimum number of RFID readers.

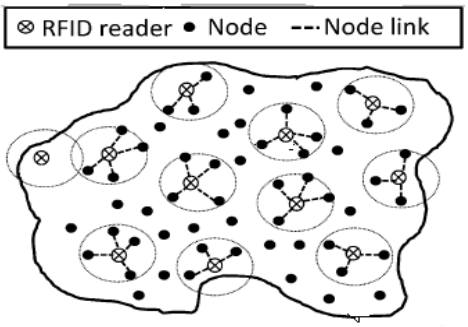

Figure 6.Traditional RFID architecture.

In Fig.3, only the nodes (hosts) in the transmission range of RFID readers can transfer their tag information to the RFID readers. As explained in introduction part, the direct transmission mode causes the channel contention and hence low successful transmission rate and reduces the speed of data collection.

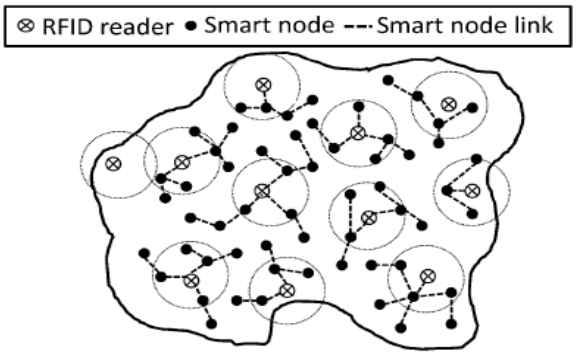

Figure 7. HRW architecture.

In Fig. 7, the nodes are smart nodes in which tag information is exchange and replicate with each other by using wireless radio frequency channel channels. Each RFID reader reads tags information within its coverage of transmission. Since the data can be transmitted to the RFID reader using a multi-hop transmission mode, each RFID reader can receive the information in tags chip outside of its transmission range but nodes must be connected in HRW. In this way, HRW can quickly collect data and accelerate the data collection. After smart nodes collects the sensed data, and timestamp is appends with sensed data and stores the data in its tag chip through RFRR.

V. V CONCLUSION

In this paper, the proposed Hybrid RFID and WSN System (HRW) that minimizes the single-hop transmission mode of WSNs and maximizes the direction transmission mode of RFID systems by which efficiency of data collection will be increased and hence system cost will be decreased with high enactment and real-time monitoring in mobile monitoring applications. HRW is conformation of RFID readers and

hybrid smart nodes. The collected packets or data are sent to a RFID reader when one of the responding node moves into the range of the RFID reader and finally this system can provide the large scale traffic handling capacity to handle huge traffic in wireless sensor network.

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[10] [10] Fig. 13. Overhead and detection probability on security mechanism.(a) Overhead. (b) Detection probability.1434 IEEE TRANSACTIONS ON PARALLEL ANDDISTRIBUTED SYSTEMS, VOL. 25, NO. 6, JUNE 2014

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