High Development of Internet of Things (IoT) Framework to Monitor the Safety of School Children in Iraq

Haider Kareem Abdulabbas
Dept. Electrical, Electronic and Systems
The National University of Malaysia
Bangi, Malaysia

Prof. Madya Dr. Mohd.Yusoff Bin Jamaluddin
Dept. Electrical, Electronic and Systems
The National University of Malaysia
Bangi, Malaysia

***Abstract*— The era of the internet of things is really challenging with daily development, and involving of internet in different life sectors. We imagine if we will use the internet of things aspect for tracing children how will be useful through RFID, and WSN, in our research challenging, we will adopt the methodology process of the Turjman et al. Then, the adoptions of the IoT motoring framework as one of the core process and the enhancement the Turjman work. Nevertheless, the result(s) will be validate by mathematical models, and will suggest the whole research design at Baghdad school – Iraq. Therefore, Turjman framework will be more reliable of hybrids RFID/WSN over IoT. It will be more interactive system , and validate when applying in real time at any of Iraqis school in term of enhance a pervious scheme based on mitigating the delay time of tag detecting.**

Keywords—IoT, RFID, WSN, SIWR, SN

I. Introduction

All Iraq's infrastructure has been degraded due to 25 years of nearly continuous conflict from 1980 until the present. From 1980 to 1988, Iraq was at war with Iran fighting over border and territorial disputes. It is estimated that the war with Iran cost Iraq $100 billion from economic loss. In August 1990, Iraq invaded neighbouring Kuwait and was defeated by a United Nations' (UN) coalition, led by the United States. After the conflict, the UN imposed economic sanctions on Iraq, which caused additional neglect to the infrastructure due to the slow growth of their economy. The UN Security Council imposed resolutions on Iraq that restricted weapons of mass destruction, long-range missiles, and required compliance with UN inspections. In March 2003, a U.S.-led invasion force entered and removed Hussein's political regime after he failed to comply with many of the UN resolutions. Due to military action and simple neglect, Iraq's 25 years of nearly continuous conflict has caused the country's infrastructure to degrade to a level that cannot adequately support its population.

The Internet of Things may be a hot topic in the industry but it's not a new concept. In the early 2000's, Kevin Ashton was laying the groundwork for what would become the Internet of Things (IoT) at MIT's Auto ID lab[1]. Ashton was one of the pioneers who conceived this notion as he searched for ways that Proctor, and Gamble could improve its business by linking RFID information to the Internet[2]. The concept was simple but powerful. If all objects in daily life were equipped with identifiers and wireless connectivity, these objects could be communicating with each other and be managed by computers. [3].

The Internet of Things Middle East (IoT- Middle East) is dedicated to accelerate the development of the IoT ecosystem within Middle East region and focus on interoperability and usability, data openness and security, and market development. Based in Riyadh, Saudi Arabia, IoT Middle East is a non-profit organization connecting a global ecosystem of companies and organizations.

II. Literature Review

IoT describes a system where items in the physical world and sensors within, or attached to these items are connected to the Internet via wireless and wired Internet connections. These sensors can use various types of local area connections such as RFID, NFC, Wi-Fi, Bluetooth, and Zigbee. Sensors can also have wide area connectivity such as GSM, GPRS, 3G, and LTE [4].

Today, many of these obstacles have solved also, the size and cost of wireless radios has dropped tremendously. IPv4 and IPv6 allow us to assign a communications address to billions of devices. Electronics companies are building Wi-Fi and cellular wireless connectivity into a wide range of devices. While not perfect, battery technology has improved and solar recharging has been built into numerous devices. There will be billions of objects connecting to the network with the next several years. For example, Cisco's Internet of Things Group (IOTG) predicts there will be over 50 billion connected devices by 2020 [5].

While, in education sectors there are at least three major benefits of IOT that will impact every business, which include: communication, control and cost savings. Things are physical items that can be connected to both the Internet and people via sensors. Sensors give things a "voice": by capturing data, sensors enable things to become context-aware, providing more experiential information to help people and machines make relevant and valuable decisions. For example, smart sensors are being used today in bridges to monitor temperature, structural integrity, and traffic density in real time. In this way, students can learn physics using their portable devices to collect and observe the bridge at peak traffic times. Capabilities like these have huge implications for learning and the potential to help transform pedagogical practices.

While, Radio Frequency Identification (RFID) is a technology that has risen to prominence over the past decade. The clear advantages of this technology over traditional identification methods, along with mandates from supply chain giants like Wal-Mart and the Department of Defence, led to a large number of research and commercialization efforts in the early 2000s.

However, almost a decade on, the early promise of widespread, ubiquitous adoption of RFID is yet to materialize. This is due to a combination of several technical and commercial factors. The technical imperfections and shortcomings existing in present-day RFID systems pose a very significant obstacle to the widespread adoption of RFID. Overcoming some of these challenges would amount to a very significant step forward towards realizing the tremendous potential of RFID technology.

However, RFID is a wireless technology that allows for automated remote identification of objects. The major components of an RFID system are tags, or transponders that are affixed to objects of interest and readers or interrogators that communicate remotely with the tags to enable identification. RFID systems exist in various flavours that can be classified based on the frequency of operation, power source of the tag and the method of communication between the reader and the tags.

However, a sensor network is an infrastructure comprised of sensing (measuring), computing, and communication elements that gives an administrator the ability to instrument, observe, and react to events and phenomena in a specified environment.

The administrator typically is a civil, governmental, commercial, or industrial entity. While, the environment can be the physical world, a biological system, or an information technology (IT) framework. Network sensor systems are seen by observers as an important technology that will experience major deployment in the next few years for a plethora of applications, not the least being national security. Typical applications include, but are not limited to, data collection, monitoring, surveillance, and medical telemetry. In addition to sensing, one is often also interested in control and activation. There are four basic components in a sensor network:

(1) An assembly of distributed or localized sensors.
(2) An interconnecting network (usually, but not always, wireless-based).
(3) a central point of information clustering; and
(4) A set of computing resources at the central point (or beyond) to handle data correlation, event trending, status querying, and data mining.

Researchers see WSNs as an ‘‘exciting emerging domain of deeply networked Systems of low-power wireless motes with a tiny amount of CPU and memory, and large federated networks for high-resolution sensing of the environment[6].

Sensors in a WSN have a variety of purposes, functions, and capabilities. The field is now advancing under the push of recent technological advances and the pull of a myriad of potential applications.

The radar networks used in air traffic control, the national electrical power grid, and nationwide weather stations deployed over a regular topographic mesh are all examples of early-deployment sensor networks; all of these systems, however, use specialized computers and communication protocols and consequently, are very expensive.

Much or less expensive WSNs are now being planned for novel applications in physical security, health care, and commerce. Sensor networking is a multidisciplinary area that involves, among others, radio and networking, signal processing, artificial intelligence, database management, systems architectures for operator-friendly infrastructure administration, resource optimization, power management algorithms, and platform technology (hardware and software, such as operating systems)[7].

This view requires the integration and interoperability of numerous wireless standards. RFID systems and WSNs are two dominant technologies that jointly constitute a class of hybrid/integrated IoT architectures known as RFID-Sensor Networks (RSNs) [8].

.

III. PROBLEM STATEMENT

A developing country, Iraq is located in the heart of the Middle East. One of its main challenges is addressing proper pedagogy at school, including how to adopt the best technologies developed in modern societies. It has noted that during times of instability, schools have difficulty controlling students and preventing them from running away or dropping out from secondary, lower and intermediate schools. The situation has led to dire concern among school administrators who are uncertain about what technology they should follow to address this issue[9].

There is tremendous value in connecting the unconnected with intelligent networks across education[10]. Nevertheless, the potential impact on making education more relevant, engaging and motivating learners, and enabling faster time to mastery. But, several issues will appear if will adopted the IoT aspects at Iraqis school, for example, sensor the tracking system for indoor system.

Furthermore, RFID already have several obstacles based on signalling efficacy, while WSN suffering from predefined sub-models with different dimensions or process noise levels, and may not guarantee good performance in the case where one of the models does not exactly match the object’s motion and tracking a rotating object in a wireless sensor network will be considered.

Based on the above discussion, it is possible to identify a two-fold problem that will serve as a point of departure for the present investigation. As has been noted above and is clarified in the later review of literature section, one problem area is the fact that many Iraqis school face running away, or children disappear from class. The second problem there are leak of awareness of IoT at education sectors in Iraq, and deteriorate the security issues based on military and police without using the IoT as a better mental, comfortable solution.

IV. METHODOLOGY

Before Baghdad school will be a main case study and s tested in Iraq Baghdad in same time, which lead us to figure the potential issues for the children's at Iraq. After that, building a road map for IoT aspects at these Iraqis school to go for the next step of RFID and WSN in IoT[11]. Furthermore the proposed positioning system combines WSN and RFID in order to compensate the limitations of each technology. On one hand, the WSN provides good radio coverage. The appropriate combinations of the two technologies could be a good strategy in building indoor/ outdoor radius positioning and tracking system with increased positioning accuracy and availability. However, there should be validation stage for the expected result of combing the RFID and WNS, Turjman framework which have adopted in this research as shown in Fig1.

.

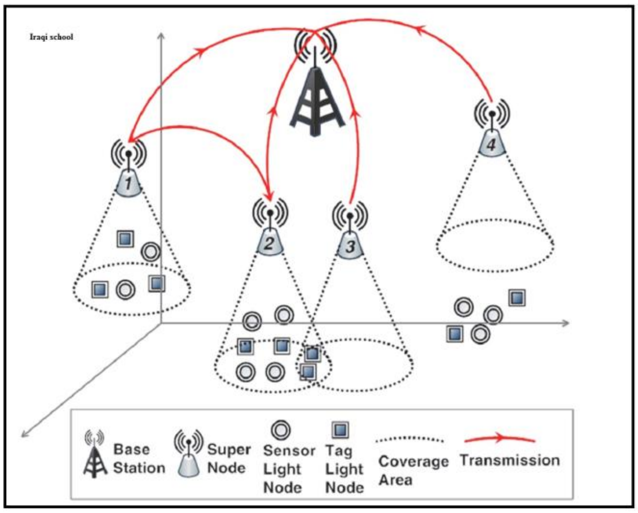

Fig1: the proposed scheme

I. EXPERIENTIAL TESTING

The SN placement problem proposed in this research has infinitely large search space and finding the optimal solution is of the utmost importance. Therefore, we propose a 3-D grid model that limits the search space to a more manageable size.Turjman assumes the knowledge of the 3-D terrain of the monitored site. Hence, practical candidate positions on the grid vertices can be predetermined.

Non-feasible positions are excluded from the search space. We use the aforementioned cubic grid's vertices to apply a novel placement scheme for SNs in an integrated SIWR architecture. This strategy is used to minimize the cost of the integrated network without violating the main requirements of RFIDs and WSNs. The former requires maintaining the right ratio of tag to reader counts, while the latter requires full connectivity. To enhance the student location inside the Baghdad school, Turjman used the placement scheme – which aims at solving the following problem:

Find the optimal locations of the least SN_{total} super nodes with the routing paths to deliver the generated data from each tag/sensor to the base station.

The optimization problem can be formulated as an ILP. We define the following constants and
Variables:

Constants:

V is the set of candidate grid vertices.

V is the number of candidate positions on the grid vertices.

SNtotal is the total available super nodes.

Fij is the flow from node I to node j (i.e. the data units to be sent from i to j).

Gi is the generated traffic by sensor node i.

SGi is the generated traffic by super node i.

Ci is the capacity of traffic (BW) available for sensor node i.

SCi is the capacity of traffic (BW) available for super node i.

Variables:

αi is a binary variable equals to 1 when a sensor is placed at vertex i of the 3-D grid and 0 otherwise.

βi is a binary variable equals to 1 when an RFID tag is placed at vertex i of the 3-D grid and 0 otherwise.

Si is a binary variable equals to 1 when an SN is placed at vertex I of the 3-D and 0 otherwise.

Pc (i,j) is the probabilistic connectivity between two nodes placed at vertices I and j.

N (i) is a set of neighboring indices such that j € N (i) if node j is within the transmission range of node i (i.e. Pc (i,j) ≥ t) , where t is the connectivity threshold.

M (N (i)) is a set of indices such that j € M (N (i)) if node j is within the transmission range of a node that can reach one of the neighboring nodes of node i via single or multiple hops.

Tij is a binary variable equals to 1 if SN i is transmitting to SN j and 0 otherwise.

The proposed ILP formulation is solved using MATLAB. We use MATLAB lp-solver v5.5 with a timeout of minutes. In other words, the ILP of a particular round is solved during the last minutes of the previous round. Based on experimental measurements as shown in Fig2

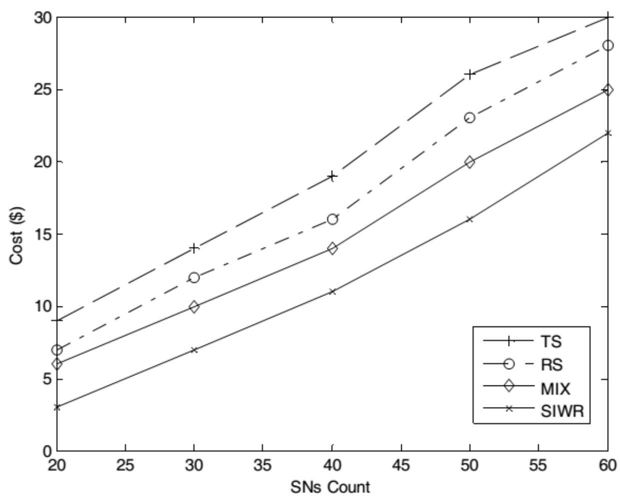

Fig2: the cost comparison with 30 SNs/m2

Nevertheless, in Table I shown the previlages of Turjman work

Table 1
The privileges of using Turjman

II. CONCLUSION

No.	Related works	Support WSN?	Support RFID	Have Hybrid integration support?
1	[12]	Yes	Yes	Yes
2	[13]	No	Yes	No
3	[14]	Yes	Yes	No
4	[15]	Yes	No	No
5	[16]	Yes	Yes	No

It not will be easy of the integrating RFID and WSN technologies has many challenges and constraints in IoT, especially, in Iraq[17]. Also, it will not feasible to adopt IoT in Iraqi school using the legacy IoT requirements from hardware, and software. To give the best effort and result of the modern edge technology of IoT,

Thus, it should to lookup for the modern, and strength research that have done in term of integration RFID, WSN in IoT. Therefore, in this research Turjman works have discriminant the most obvious refer to the additional costs related to designing integrated hardware components mitigation. Furthermore, Turjman claim that such components are naturally more expensive than simple sensors or tags and may operate both wireless communication protocols either simultaneously, or alternatively.

Thus, precise and non-redundant placement of integrated devices is a critical factor in determining the cost efficiency of any integrated RSN system. This research will adopt the framework of Turjman that it has address the placement problem in RSN topologies by first introducing a novel integration approach that concentrates the cost factor in a single RSN component composed of a relay and an RFID reader. This research will use this integrated node as a Super Node (SN) based on Turjman, Nevertheless, utilizing the exits framework will minimizing the system's cost implies minimizing the count of SNs in the topology, which consequently requires their optimal placement to be in a manner that attains maximum coverage at challenge middle-east zone , which it Iraq.

V. REFERENCE

[1] A. Manches, P. Duncan, L. Plowman, and S. Sabeti, "Three questions about the Internet of things and children," *TechTrends*, vol. 59, no. 1, pp. 76-83, 2015.

[2] K. Michael, and L. McCathie, "The pros and cons of RFID in supply chain management." pp. 623-629.

[3] L. Barker, M. White, M. Curran, Z. Patoli, B. Huggins, T. Pascu, and N. Beloff, "Taxonomy for Internet of Things-Tools for Monitoring Personal Effects." pp. 67-71.

[4] A. Depari, C. De Dominicis, A. Flammini, S. Rinaldi, and A. Vezzoli, "Integration of Bluetooth HandsFree Sensors into a Wireless Body Area Network Based on Smartphone," *Sensors*, pp. 547-551: Springer, 2014.

[5] K. Nahrstedt, "Internet of mobile things: challenges and opportunities." pp. 1-2.

[6] M. Conti, and S. Giordano, "Mobile ad hoc networking: milestones, challenges, and new research directions," *Communications Magazine, IEEE*, vol. 52, no. 1, pp. 85-96, 2014.

[7] T. A. Sheikh, K. C. Baruah, and D. Muchahary, "Some Power Management Technology and Algorithm in Mobile Ad Hoc Network," *International Journal of Advanced Electronics and Communication Systems*, vol. 3, no. 5, 2014.

[8] M. Ilyas, S. S. Alwakeel, and M. M. Alwakeel, *Sensor Networks for Sustainable Development*: CRC Press, 2014.

[9] J. Rodden, "Iraq, the internet, and intellectuals: Interviews by John Rodden," *Society*, vol. 45, no. 2, pp. 112-124, 2008.

[10] T. Palonen, and K. Hakkarainen, "Social network analyses of learning at workplaces," *Discourses on Professional Learning*, pp. 293-315: Springer, 2014.

[11] B. F. Hummadi, and A. AlObaidi, "Social Phobia among Secondary School Students in Baghdad/Iraq," *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, vol. 23, no. 1, pp. 70, 2014.

[12] F. M. Al-Turjman, A. E. Al-Fagih, W. M. Alsalih, and H. S. Hassanein, "A delay-tolerant framework for integrated RSNs in IoT," *Computer Communications*, vol. 36, no. 9, pp. 998-1010, 2013.

[13] J. Xiaolin, F. Quanyuan, F. Taihua, and L. Quanshui, "RFID technology and its applications in Internet of Things (IoT)." pp. 1282-1285.

[14] T.-H. Shin, S. Chin, S.-W. Yoon, and S.-W. Kwon, "A service-oriented integrated information framework for RFID/WSN-based intelligent construction supply chain management," *Automation in Construction*, vol. 20, no. 6, pp. 706-715, 10//, 2011.

[15] F. Mattern, and C. Floerkemeier, "From the Internet of Computers to the Internet of Things," *From active data management to event-based systems and more*, pp. 242-259: Springer, 2010.

[16] C. M. Kruesi, R. J. Vyas, and M. M. Tentzeris, "Design and Development of a Novel 3-D Cubic Antenna for Wireless Sensor Networks (WSNs) and RFID Applications," *Antennas and Propagation, IEEE Transactions on*, vol. 57, no. 10, pp. 3293-3299, 2009.

[17] M. Carr, "Internet freedom, human rights and power," *Australian Journal of International Affairs*, vol. 67, no. 5, pp. 621-637, 2013.