A Survey of Internet of Things Using WSN for Real Time Data Acquisition

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Abstract— Now a days in wireless sensor network we use IPv4 for data (packet) transmission but in this technique user cannot access the large data over large distance communication for transmission of large data using IPv4 it may require large power consumption otherwise data may loss during transmission. This drawback can be eliminate by using Internet of Things (IoT), In this technique user can use IPv6 technique for the large data transmission over a long distance using less power consumption. Internet of things object have their own unique address and their virtual representations in an Internet-like structure. Such objects may link to information about them, or may transmit real-time sensor data about their state or other useful properties associated with the object.

Keywords—*Wireless Sensor Network; IPv4; transmission; power consumption; internet of things*

I. INTRODUCTION

The Internet of things is the network of physical objects with embedded technology to sense, communicate and interact with their internal states or the external environment [1]. In the WSN context, data may transmit by using different hardware nodes which can be transmit data to the cluster head of a network then cluster can transmit it to the base station. In this technique data can transmit over a small distance. Data can be transmitted over a large distance but it requires large power otherwise data may loss. How Telefónica Foundation noted in its latest report on Smart City [4], in a technological context, the concept of Smart City and the Internet of things are two terms that go together, because both concepts have in M2M communications its foundation and both of them bring the Internet of the Future that would allow the connection not only people but also objects, shaping a digital world.

Technologies as M2M communications and cloud provide the ability to connect efficiently all elements in the intelligent city and collect information from them. What is done with that information, the use given to it, is what makes the difference between an intelligent city from another one.

The connected city produces a huge amount of information, which helps us make smart decisions and implement more and more efficient services. From this perspective such technologies would allow citizens to control their lives and influence the city in various fields such as health, education, culture, energy and all other parameters of environment. For example: Amsterdam Smart City Project has implemented Energy Supply 2.0[3], a system that allows citizens to choose where to buy the energy, the way they produce their own energy from renewable sources, and if they want to sell it to their neighbors or not.

The true value of the Internet of Things and its business impact lies in its applications, which ultimately are the translation of what it is decided to do with the large amount of information captured in the field of Smart City. In this sense, cities become smart through the deployment of intelligent infrastructure, composed for example of ubiquitous sensors that allow monitoring of municipal facilities, wireless systems that detect available parking spaces, or management systems for lighting or measuring atmospheric and environmental conditions, among others.

The relevance and the role that will be played both the open source software, and open standards in the Internet of Things will be double [2]: On the one hand, the variety of devices connected to the Internet makes impossible or very difficult, for any company or even a group of companies, write code for the millions of different systems that will be joining the Internet of Things. The only way this will work is if the code is open source, so that manufacturers and hackers simply fit your favorite device. That is just what has happened with some of the most successful codes in the field of mobile phones. The other reason that gives an advantage to open source in the field of Internet of Things is the quiet revolution that has taken place in recent years.

II. BACKGROUND

A. Microcontroller

For this application, we are using Atmega32u4 as processor. There are many processors available like Atmaga8, Atmaga16, Atmega32, Atmega32u2 but because of some advantageous specifications of Atmega32u4 (processor) over other processors, we are ought to use Atmega32u4. Some advantages of '32u4 over '32u4 are as follows:

- More RAM (2.5k vs. 1k)
- More pins (48 vs. 32)
- Analog-to-digital converters instead of just analog comparators
- Low frequency crystal option instead of full swing crystal option

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- An I2C interface.

B. Transmitter / Reciever

802.15.4/ Zigbee

The XBee modules for communication in the ISMB (Industrial Scientific Medical Band) bands.These modules communicate with the microcontroller using the UART_0 and UART_1 at 112500 bps. There are four possible modules distributed

TABLE I.

Model	Protocol	Frequency	txPower	Sensitivity	Range
XBEE-802.15.4-Pro	802.15.4	2.4GHz	100mW	-100dBm	7000m
XBEE-ZB-Pro	ZigBee-Pro	2.4GHz	50 mW	-102 dBm	7000m
XBEE-868	RF	868MHz	315 mW	-112 dBm	12km
XBEE-900	RF	900 MHz	50 mW	-100 dBm	10km

These modules have been chosen for their high receiving sensitivity and transmission power, as well as for being 802.15.4 compliant (XBee-802.15.4 model) and ZigBee-Pro v2007 compliant (XBee-ZB model).

Wifi

The WiFi module completes the current connectivity possibilities enabling the direct communication of the sensor nodes with any WiFi router in the market. As well as this, this radio allows Wireless module to send directly the information to any iPhone or Android Smartphones without the need of an intermediate router, what makes possible to create WiFi sensor networks anywhere using just Wireeless node and a mobile device as all of them run with batteries.

With this radio, Wireless module can make HTTP connections retrieving and sending information to the web and FTP servers in both normal and secure modes (HTTPS/FTPS), as well as using TCP/IP and UDP/IP sockets in order to connect to any server located on the Internet.

Bluetooth

The Wireless module Bluetooth Pro module (or simply, Bluetooth) uses the same socket as the XBee does. This means you can change the XBee module for the Bluetooth module as they are pin to pin compatible.

Bluetooth Low Energy

The Wireless module Bluetooth Low Energy module uses the same socket as XBee does. This means that you can change XBee module for the BLE module as they are pin to pin compatible.

GSM/GPRS

Wireless module can integrate a GSM (Global System for Mobile communications) / GPRS (General Packet Radio Service) module to enable communication using the mobile telephone network.

3G + GPS

Wireless module can integrate a UMTS (Universal Mobile Telecommunication System based in WCDMA technology) / GPRS (General Packet Radio Service) module to enable communication using the 3G/GPRS mobile telephone network.

III. SENSORS

The best part of this application is sensors employed in this wireless module. In Wireless sensor networks, Desirable functions for sensor nodes include: ease of installation, self-identification, self-diagnosis, reliability, time awareness for coordination with other nodes.

A. IEEE 1451 Standard

There are many sensor manufacturers and many networks on the market today. It is too costly for manufacturers to make special transducers for every network on the market. Different components made by different manufacturers should be compatible. Therefore, in 1993 the IEEE and the National Institute of Standards and Technology (NIST) began work on a

TABLE II
SENSORS FOR SMART ENVIRONMENT

Measurements for Wireless Sensor Networks		
Properties	**Measuring Parameter**	**Transduction Principle**
Physical Properties	Pressure	Piezoresistive, capacitive
	Temperature	Thermister,thermo-mechanical, thermocouple
	Humidity	Resistive, capacitive
	Flow	Pressure change, thermister
Motion Properties	Position	E-mag, GPS, contact sensor
	Velocity	Doppler, Hall effect, optoelectronic
	Angular Velocity	Optical encoder
	Acceleration	Piezoresistive, piezoelectric, optical fiber
Control Properties	Strain	Piezoresistive
	Force	Piezoelectric, piezoresistive
	Torque	Piezoresistive, optoelectronic
	Slip	Dual torque
	Vibration	Piezoresistive, piezoelectric, optical fiber, Sound, ultrasound

Presence	Tactile/contact	Contact switch, capacitive
	Proximity	Hall effect, capacitive, magnetic, seismic, acoustic, RF
	Distance/range	E-mag (sonar, radar, lidar), magnetic, tunneling
	Motion	E-mag, IR, acoustic, seismic (vibration)
Biochemical	Biochemical agents	Biochemical transduction
Identification	Personal features	Vision
	Personal ID	Fingerprints, retinal scan, voice, heat plume, vision motion analysis

standard for Smart Sensor Networks. IEEE 1451, the Standard for Smart Sensor Networks was the result. The objective of this standard is to make it easier for different manufacturers to develop smart sensors and to interface those devices to networks. [5].

B. Smart Sensors and Virtual Sensors

The figure shows the basic architecture of IEEE 1451 [5]. Major components include STIM, TEDS, TII, and NCAP as detailed in the fig. 1. A major outcome of IEEE 1451 studies is the formalized concept of a Smart Sensor. A smart sensor is a sensor that provides extra functions beyond those necessary for generating a correct representation of the sensed quantity [6]. Included might be signal conditioning, signal processing, and decision-making/alarm functions. A general model of a smart sensor is shown in the figure. Objectives for smart sensors include moving the intelligence closer to the point of measurement; making it cost effective to integrate and maintain distributed sensor systems; creating a confluence of transducers, control, computation, and communications towards a common goal; and seamlessly interfacing numerous sensors of different types. The concept of a Virtual Sensor is also depicted. A virtual sensor is the physical sensor/transducer, plus the associated signal conditioning and digital signal processing (DSP) required obtaining reliable estimates of the required sensory information. The virtual sensor is a component of the smart sensor.

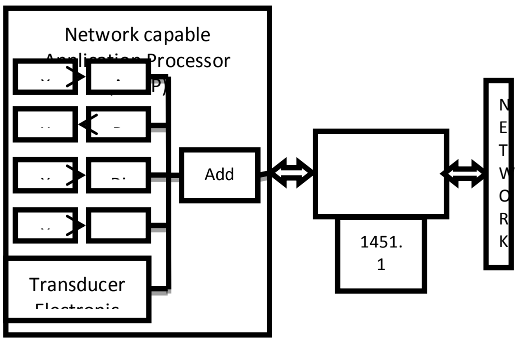

Fig. 1: The IEEE 1451 standard for smart sensor networks

IV. LITERATURE SURVEY

In 2001, *Schurgers* et al worked on 'Energy Efficient Routing in Wireless Sensor Networks'. His first approach was to use a concept termed as Data Combining entities or DCE's. This concept is similar to clustering, instead of designating a cluster head; it picked up a node that has other streams of network traffic flowing through it as the DCE [7]. The second approach discussed by *Schurgers* et al to reduce energy consumption in a wireless sensor network is the spreading of network traffic over the entire network. In the same year, *Slijepcevic et al* in the paper 'Power Efficient Organization of Wireless Sensor Networks' discussed on reducing the overall power in the network system by grouping the sensor nodes into mutually exclusive sets in 2001 [8]. This technique assumed that the nodes are placed stochastically.

"Maximizing System Lifetime in Wireless Sensor Networks" by *Dong*, is one of the first papers to differentiate between the "time" and "transmission" approaches to overall lifetime of a wireless sensor node network in 2005 [9]. He considered many different time based and packet based models. *Chao-Lieh Chen et al* authored the paper "Energy-proportional Routing for Lifetime extension of Clustering-Based Wireless Sensor Networks" in 2007. He presented an algorithm to determine the energy usage for nodes in an upcoming round of data collection and transmission; it then determines if a cluster-head or a node should be used for forwarding tasks or transmits data to intermediate hops [10].

In 2008 *Kim et al* in his paper 'Minimizing Delay and Maximizing Lifetime for Wireless Sensor Networks with Anycast' pertained a unique type of wireless sensor network, namely an event-driven network that uses ''Anycast". Utilized a wake-sleep cycle for the sensor nodes, i.e. instead of having one node that a sensor node will transmit its messages to, a node will have a group of candidate nodes that it can transmit to [11]. *Jiang et al* worked on classification of WSN clustering schemes based on 8 clustering attributes in 2009. He also analyzed popular WSN clustering algorithms and also comparision between those algorithms [12]. *Vipul Gupta* worked on developing a web-based service called Sensor network that facilitates a heterogeneous mix of devices to interact with one another in the paper 'Sensor Network: An open data exchange for the web of things' in year 2010 [13].

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