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An Information Framework for Creating a Smart City through Internet of Things

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ABSTRACT— Large population and industrialization in city area demands provision of communication of objects to each other to create smart cities. In smart city government, management and local people are provided with access to various real-time information about the environment and local objects on which automatic decisions, actions are planned. This paper presents a one way of crating smart cities for local infrastructures through the Internet of Things (IoT). The system consists of information system, from the sensors and networking through to data monitor and data control using website and mobile application. This paper can provide solution to data with minimum human efforts.

KEYWORDS: IOT, Smart city, wireless sensor network.

I. INTRODUCTION

The Internet of Things (IoT) [1] offers promising solutions to transform the operation and role of many existing industrial systems such as transportation systems and manufacturing systems. For example, when IoT is used for creating intelligent transportation systems, the transportation authority can be able to track every vehicle's existing location, also monitor its movement, and predict its future location and possible road traffic. The term IoT was initially used to refer to unique identifiable interoperable connected objects with RF identification. Internet of things later relates with more technologies such as sensors, actuators, GPS devices, and mobile devices [2].

A global network infrastructure with reconfigurable computing techniques and capabilities based on standard and interoperable communication protocols where physical land virtual 'Things' have identities, physical attributes, and virtual personalities and use intelligent interfaces, and are seamlessly integrated into the information network Specifically, the integration of sensors/actuators, RFID tags, and communication technologies[3] serves as the foundation of IoT and explains how a variety of physical objects and devices around us can be associated to the Internet and allow these objects and devices to cooperate and communicate with one another to reach common goals. There is a growing interest in using IoT technologies in various industries. A number of industrial IoT projects have been conducted in areas such as agriculture, food processing industry, environmental monitoring.

II. RELATED WORK

In 2013 Takeshi Yashiro, Shinsuke Kobayashi, Noboru Koshizuka, and Ken Sakamura [1] propose the uID-CoAP architecture, it is a new IoT framework that aims to provide a solution for this issue. That is the way he proposes a new way to let the existing embedded systems be integrated into the IoT network. For this purpose, he presents the IoT network architecture is made up of two existing technologies: constrained application protocol CoAP and ubiquitous ID (uID) architecture. The fundamental idea here is to build an IoT network made up of RESTful services, with the help of semantic knowledge backend provided as the uID database. Also this semantic database is essential for the embedded appliance nodes to know how they can work together in cooperation. For simple sensor network nodes, simply sending data to or accepting requests from base stations would suffice, but for household embedded appliances,

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decision-making process on each node would become more complex. For this purpose, the uID database system provides an excellent solution for knowledge management required in IoT, by providing a unique identifier (called ucode) that is separate from network addresses.

In 2014 Joaquin Gutierrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, and Miguel Angel Porta Gandara [3] introduces the development of the system which uses deployment of an automated irrigation system based on microcontrollers and wireless communication at experimental scale within rural areas is presented. The aim of the implementation was to demonstrate that the automatic irrigation can be used to reduce water use. The implementation is a photovoltaic powered automated irrigation system that consists of a distributed wireless network of soil moisture and temperature sensors deployed in plant root zones. Each sensor node involved a soil-moisture probe, a temperature probe, a microcontroller for data acquisition, and a radio transceiver; the sensor measurements are transmitted to a microcontroller-based receiver.

III. PROPOSED SYSTEM

The goal of this project is to create a framework for creating system based on internet of things so that the local government can gather data from various system like electrical meter reading, form wireless sensor networks like Zig-bee networks, PIR, humidity sensors, street lights etc. This system can also control the street light, wireless sensor networks etc. The data gathering, monitoring and controlling can be done through internet so the process of gathering data, monitoring other systems and controlling the systems will be real-time.

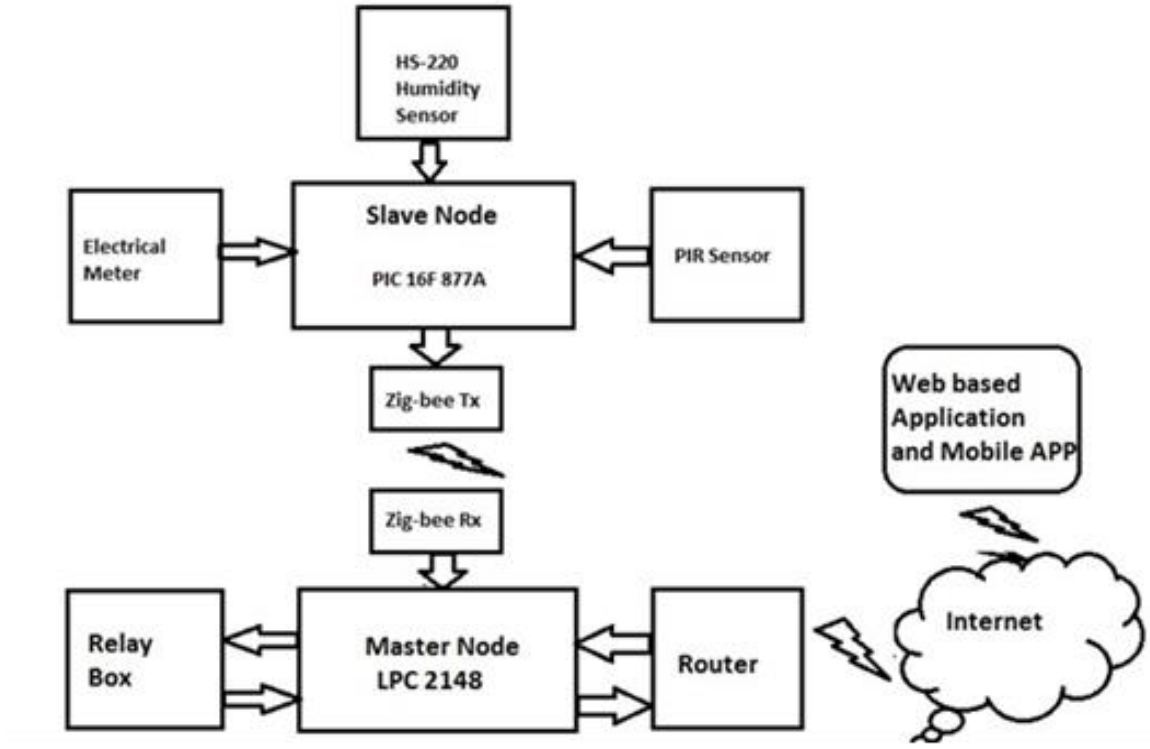

Fig. 1 Block diagram of Framework for smart city

The proposed system consists of various applications like wireless sensors network of zig-bee, electrical meters, Moisture sensors, PIR sensors, GPS, Relays etc. system consist of slave node which capture the data from wireless sensor network. Wireless sensor network gathers data from electrical meter, GPS this data from sensors are transfer to master node through Zig-bee transceiver. At master node, data from electrical meter, GPS is stored in to EEPROM after every 10 seconds. Master node also consists of moisture sensor, relays to control the lights and other

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systems. A web application and the android application is developed to monitor and control the master node and master node controls the slave node. A user is provided with login ID and Password, whenever user wants to monitor data, user send the request to master node then according to request master provide the data like GPS Latitude and Longitude, Meter reading etc. to web based application through internet. If user wants to control the system, user send command to master unit, according to command master operate the relays through internet. This system is designed so that user can monitor and control data from anywhere in the world where internet is available.

A. Master Node

Master node consists of microcontroller LPC 2138 which is ARM 7 32-bit powerful microcontrollers for IOT application. This controller works on 3.3 V power supply. The data to router is transfer by using SPI to Ethernet converter which converts the Serial data in to Ethernet data. Master node consists of EEPROM to store the data from meter unit and GPS. A 64 K byte EEPROM is used this data which is quite sufficient for this application. A Zig-bee interface is provided to receive data from various slave nodes. The functionality of master node is to capture data of meter reading moisture sensor, PIR sensor from slave unit through Zig-bee receiver and store the data into EEPROM also master unit store data from GPS which is at master node. Whenever web application sends the request, master node sends this stored data to web application. Master node also consists of relay box to control the various systems through relays. Whenever web based application send the command to master node it controls the relays as per commands.

B. Slave Node

Slave node is design to actual deployment of the sensors on the field. It provides the interface between sensors and the Master node. It consist of Microchip 8 bit microcontroller PIC 16F877A which capture data from PIR sensor, electrical meter, moisture sensor. After the processing data it transmit it to Master node through Zig-bee transmitter. Data transfer rate is 10 sec which can be configurable. Out of the electrical meter reading is taken from 12 bit ADC. PIR sensor gives output from range 0-255 while Moisture sensor gives reading from 0 – 255.

C. Web based Application

Web based application is used to control and monitor data from anywhere. Web based application consist of login page where user has to enter the login details to get access over monitoring and controlling the devices. This application is developed in .NET frame work. A database is created to store the monitored information. Below figure 2 shows the Login page.

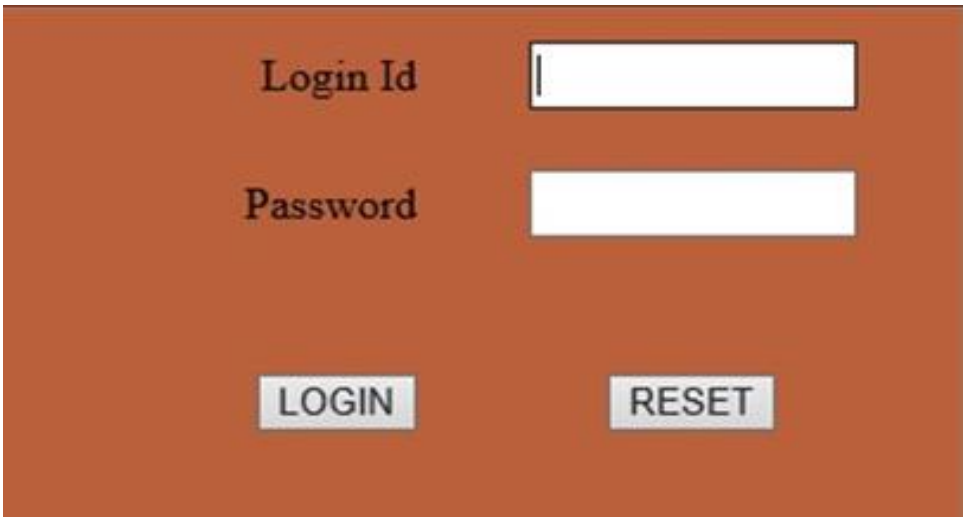

Fig. 2 Web based application Login Page

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D. Mobile Application

Now a day almost everyone is having smartphones so for more simplicity to access data i.e. to monitor and control the data. This application is based on android. Same database of web application is used for android application.

IV. EXPERIMENTAL RESULTS

Following figures show the experimental results carried out. Figure 2 shows .NET based application for this project User can log in into web based application by using log in ID provided to user. After the login user will see below screen shown in figure 3. If user wants to monitor data, then he can send the request on clicking on data field he wants. User can also send the current date and time to Master node though web application. User can control the devices by clicking on respecting devices to switch them ON or OFF as shown.

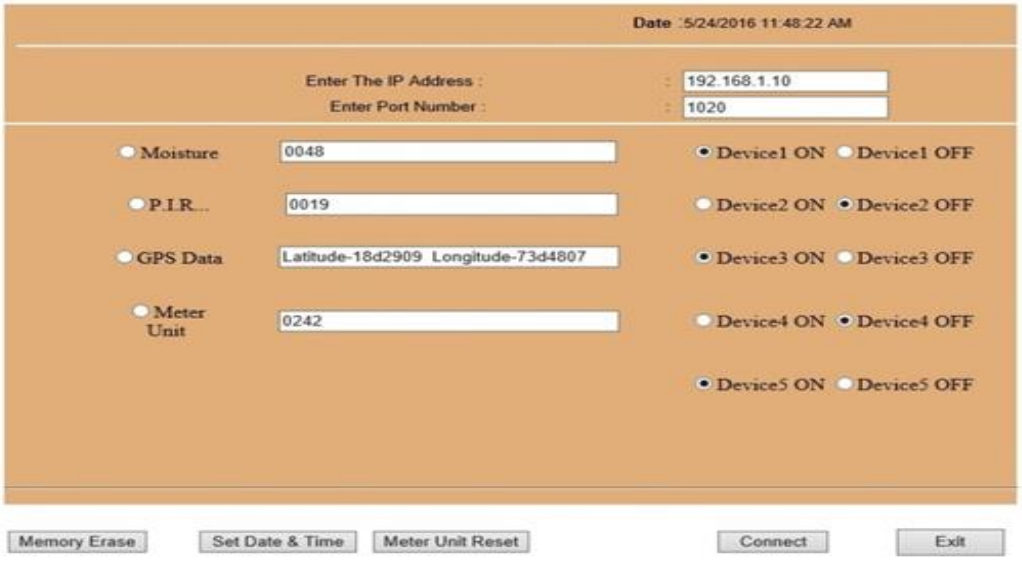

Fig.3 Experimental Results

V. CONCLUSION

The system presented can be used to monitor and control the various applications in smart city. The information which was monitored and controlled was pretty accurate. This system is close loop system. This system proves that the existing wireless sensor network can be integrate with internet to create smart city along with some additional devices as mentioned in proposed system.

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REFERENCES

[1] **Takeshi Yashiro, Shinsuke Kobayashi, Noboru Koshizuka, and Ken Sakamura, "An Internet of Things (IoT) Architecture for Embedded Appliances", augest 2013.**

[2] **Sara Amendola, Rossella Lodato, Sabina Manzari, Cecilia Occhiuzzi, and Gaetano Marrocco, "RFID Technology for IoT-Based Personal Healthcare in Smart Spaces", IEEE INTERNET OF THINGS JOURNAL, VOL. 1, NO. 2, APRIL 2014.**

[3] **Joaquin Gutierrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, and Miguel Angel Porta Gandara, "Automated Irrigation System Using a Wireless Sensor Network and GPRS Module", IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT, VOL. 63, NO. 1, JANUARY 2014.**

[4] Chi-Man Vong, Pak-Kin Wong, Ka-In Wong, Ziqian Ma, "Inspection and Control of Vehicle Emissions through Internet of Things and Traffic Lights", International Conference on Connected Vehicles and Expo (ICCVE) ,2013,

[5] Li Da Xu, Wu He, and Shancang Li, "Internet of Things in Industries: A Survey", IEEE TRANSACTIONS ON INDUSTRIAL INFORMATICS, VOL. 10, NO. 4, NOVEMBER 2014.

[6] Mihai T. Lazarescu, "Design of a WSN Platform for Long-Term Environmental Monitoring for IoT Applications", IEEE JOURNAL ON EMERGING AND SELECTED TOPIC IN CIRCUITS AND SYSTEMS, VOL.3,NO.1,MARCH 2013.

[7] Jiong Jin, Jayavardhana Gubbi, Slaven Marusic, and Marimuthu Palaniswami, "An Information Framework for Creating a Smart City Through Internet of Things", IEEE INTERNET OF THINGS JOURNAL, VOL. 1, NO. 2, APRIL 2014.