

# An IOT Based Environmental Radiation Monitoring Through Wireless Sensors Network

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## ABSTRACT

This paper presents the functional design and integration of a complete WSN platform that can be used to remote environmental monitoring and target for IoT applications. The system of physical object devices, vehicles, buildings and other items embedded with sensors, electronics, software and network connectivity that enables these objects to collect and exchange data, this is called IoT. IoT is estimated to generate large amounts of data from diverse locations. IoT is one of the platforms for today's smart city and smart energy management systems. Wireless Sensor Network (WSN) is used to monitor environmental conditions such as sound, pressure, temperature etc. The application requirements are long lifetime, low cost, fast deployment, low maintenance; high number of sensors and high quality of service are considered in the specification. Low-effort platform reuse is also considered for the specifications and design levels for a wide range of related monitoring applications.

**Keywords:** ARM7, Internet of Things (IoT), Sensor, data acquisition.

## INTRODUCTION

The Future internet, called as "Internet of things" is seen to be a worldwide network of interconnected objects with unique address having standard communication protocols. A system like sensors, RFID tags, computers, or mobile phones will be able to dynamically connect to the network, collaborate, and work efficiently to achieve different tasks. Including WSN platform in such a environment will open new directions or perspectives. Any physical system can be controlled and operated easily by using wireless technology if it is compared to manual operation. If this automation is considered for environmental monitoring, it responds very fast. Also it increases chances of secure communication, speed of the system operation. Human entered data was seen as a limiting factor for acquisition systems, cost and

pervasiveness. Two main technologies are called as a key enablers for IoT are RFID i.e., Radio Frequency Identification Tag and WSN i.e., Wireless Sensor Network. While considering application field, WSNs plays very important role by collecting surrounding information and context. WSN helps to reduce physical efforts in the automated systems. WSN bring richer capabilities to IoT application for both sensing and actuation. The proposed system can be called as a smart system as it can measure parameters automatically. Sudden and gradual changes in environment had taken place in recent times because of human careless activities in relation to environment. This results in disasters which can cause harms to human lives. The system can intimate in advance to user about such causalities. This system also uses GSM module for the wireless control of environmental parameters. In this system, GSM network is used to give the status of each sensor connected to the controller on mobile. Applications and limitations of this monitoring system are discussed briefly.

## THE OVERALL SYSTEM ARCHITECTURE

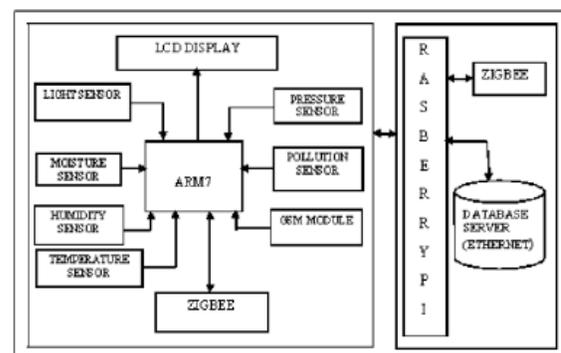


Figure1: The overall system architecture

The above figure shows the overall system architecture of environmental monitoring wireless sensor network system. This system consists of raspberry pi as a base station, number

of distributed wireless sensor nodes and zigbee protocol. Raspberry pi manages multiple sensor nodes. Each sensor node is combination of sensors, microcontroller and zigbee radio transceiver (Xbee module). Sensor node is a major part in this system it is responsible for information or sensor data collection and distribution. In this system architecture, we have combined the gateway node of wireless sensor network, that is raspberry pi (base station) which consists of database server and web server in one single-board of computer hardware platform, it reduces the cost and complexity of deployment. In system architecture the Sensor node senses the data from the sensors and that data is received at the end tag. End tag searches for the nearest router, if the router is in its range it immediately send the data to the neighboring router, and next router to the coordinator, here coordinator is directly communicates with the base station. Base station sends all data to the cloud or Ethernet (Database server). End Users or clients can interact with the web application within the local area network from any terminal on the Internet to access the sensor data, otherwise it perform remote configuration and management of deployed sensor nodes. As compared to the large scale TEO environmental system that has developed earlier, the presented system design in this paper is well suited for small-scale environment.

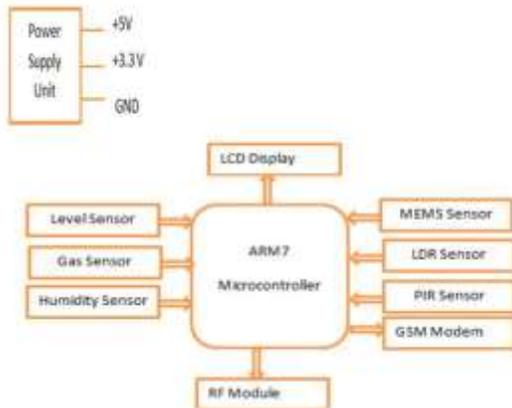


Figure2: Block diagram of Transmitter with GSM Modem and Power Unit

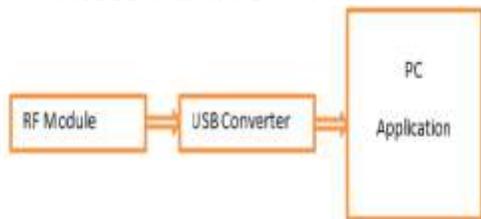


Figure3: Block diagram of receiver

**BLOCK DIAGRAM DESCRIPTION**

The block diagram is divided into following modules:

**1. Power supply:** When working with electronics, the basic necessity is a regulated power supply. Power supply is required in every electronic circuit. Each and every component will work properly, when the exact amount of voltage and current is supplied to it. If the power exceeds its limit, it can be fatal. Power supply which gives output of 5V, 3.3V is used in the system, as it is the minimum requirement for the microcontroller.

**2. LPC 2138 Microcontroller:** The NXP (Philips) LPC 2138 is an ARM7TDMI-S based 32 bit RISC microcontroller. LPC 2138 processor is used in proposed system to monitor and control the process. LPC 2138 saves up to 33% less power than other microcontrollers. It consists of 512 kB high speed flash memory. All the sensors are interfaced to LPC 2138, which is heart of the system. On chip ADC improves the performance of LPC 2138. PIR & LDR sensors connected are digital sensors & other four sensors are analog sensors.

**3. Sensor module:** Sensors module consists of six types of sensors. These sensors collect information about status of environmental parameters and feed it to controller. Functioning of these sensors is given here.

**a) Level sensor:** Float Sensor is an electrical ON/OFF Switch, when liquid level goes up or down with respect to specified level it operates automatically. The signal from float sensor can be utilized for control of motor or relays. Float Sensors contain hermetical sealed Reed Switch in the stem and a permanent type magnet in the Float. As the float rises or falls with the level of liquid the Reed switch is activated by magnet. working: Available either Normally Open, Normally Close, Change Over Contact Form If water crosses to the danger level in dam, tank or reservoirs, level sensor will check water level & it will processes signal accordingly. Level sensor is Float sensor type. It operates automatically when liquid or water level goes up or down with respect to its specified level. Thus the Signal available from the float Sensor can be used for control Pump or allied electrical elements.

**b) Gas sensor:** The Gas Sensor used here is enveloped MQ-7, which have 6 pin 4 of them are used to fetch signals, and other 2 are used for providing heating current. MQ 7 is highly sensitivity to

carbon monoxide. Gas sensors are designed to detect and measure the dangerous and harmful gases like carbon monoxide and CO<sub>2</sub>. This Gas sensor will detect and measures the levels of these gases and gives intimation of ratios or levels of dangerous gases mixed in the environment to end user. MQ7 gas sensor is used to sense the CO<sub>2</sub>, whenever it detect the excess amounts than to be released, it will give intimates like “Gas Detected”, and the output is given through ADC pin of ARM 7.

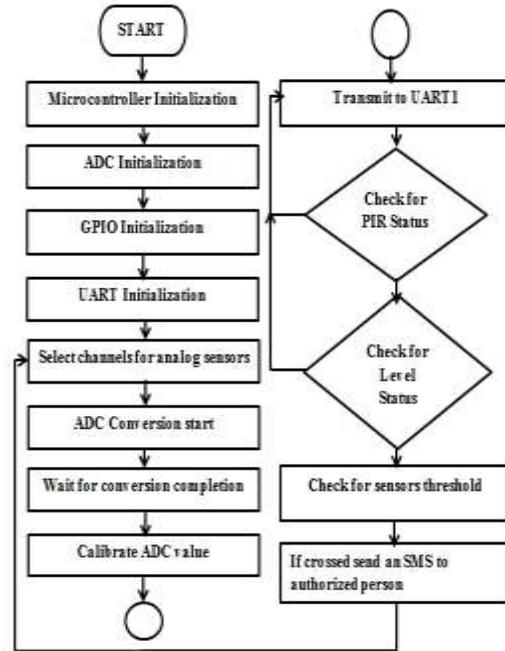
**c) Humidity sensor:** SY-HS-220 sensor is used to check the water vapor contained in the air or environment. Like other analog sensors it also gives output in the form of humidity, if it detected any drastic changes in humidity levels in environment. The Sensor’s output is connected to the analog pin of processor.

**d) MEMs sensor:** Micro-electro-mechanical systems sensor is used to measure shocks, dynamic acceleration, vibration and static acceleration (tilt or gravity). ADXL 335 with 3 axis sensing, low power is preferred. It can survive at 10000 g shocks.

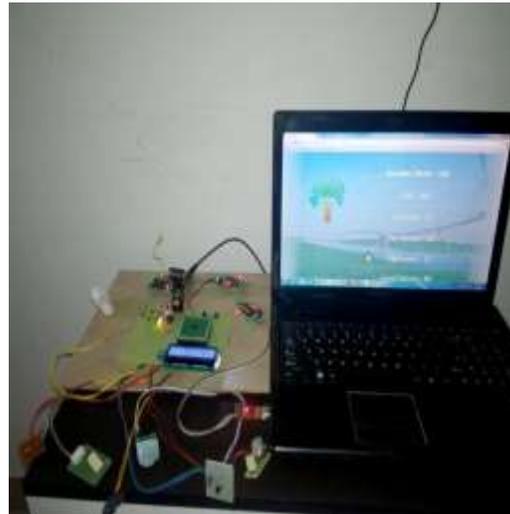
**e) LDR sensor:** Light Dependent Resistor (LDR) is used to detect light intensity. It helps in maintaining light intensity required to maintain environment. Example: Green houses.

**f) PIR sensor:** Pyro-electric infrared module sensor allows users to sense motion, mostly used to detect whether human or animal body has moved in the sensor range. Module provides an optimized circuit that will detect moving animal up to 6 meters away. It is inexpensive, small in size, easy to use. These sensors are helpful at the high radiant zone where the trespassing of human and the animals causes severe issues. When any human body or any animal is detected output of PIR sensor goes high.

**FLOWCHART FOR THE SYSTEM**



**EXPERIMENTAL RESULTS**



*Figure4: Experimental setup for the system*

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Figure5: Result in tabular form using Java application on PC

### CONCLUSION

Wireless Sensor Network is designed successfully and implemented for the purpose for which it has been designed. On observation of the performance it is concluded that the present system is reliable and variety of applications can be applied. Application parameters calculation and monitoring is precise and automatic even over the larger area. System can be monitor globally using uploaded data over internet. GSM is an alternative secure way to the internet. Parameters threshold can be changed depending upon the environment.

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### REFERENCES

- [1] Mihai T. Lazarescu, "Design of a WSN platform for long-term environmental monitoring for IoT applications," Emerging and Selected Topics in Circuits and Systems, IEEE Journal on, Vol.3, Issue.1 pp.45-54, 2013
- [2] Datasheets of LPC 2138, www.nxp.com.
- [3] Datasheets of PIR sensor, www.instructables.com/id/PIR-Motion-Sensor-Tutorial.
- [4] Vasumsetty UdayAditya, "GSM based wireless control of electrical appliances", 2014
- [5] Datasheets of RF Transciever 2.4 Ghz , www.sunrom.com.
- [6] J. Peng, X. Hongbo and W. Zheming, "Design of a Water Environment Monitoring

System Based on Wireless Sensor Networks", *SENSOR* vol.9, No.8, pp: 6411-6434, 2009.

[7] Datasheets of GSMSIM900, XM1510S Quick Start Manual.

[8] I. F. Akyildiz, W. Su, Y. Sankara subramaniam and E. Cayirci, "Wireless Sensor Networks: a survey", *Computer Networks*, vol.38, pp: 393-422, 2002.

[9] J. Yang and X. Li, "Design and implementation of low-power wireless sensor networks for environmental monitoring," *Wireless Commun., Netw. Inf. Security*, pp. 593–597, Jun. 2010.

[10] M. Anisi, A. Abdullah and S. Razak, "Energy-Efficient Data Collection in Wireless Sensor Networks," *Wireless Sensor Network*, Vol. 3 No. 10, 20

[11] Pascal Von Rickenbach, "Energy-Efficient Data Gathering in Sensor Networks".

[12] Internet of Things in 2020: Road map for the Future, 2008, online, <http://www.smart-systems-integration.org/public/internetofthings>.