



# INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume 5, Issue 2)

Available online at: [www.ijariit.com](http://www.ijariit.com)

## IoT based interactive warehouse monitoring system integrated with Android application

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### ABSTRACT

An integrated warehouse management module is provided enabled by IOT (Internet of Things). The system and method are providing capacity and capability of remotely managing the warehouses consists, edible materials including food grains and providing of vital information like moisture contents, contamination levels if any to the warehouse managing team. The device is enabled with necessary facilities for storing of vital information in cloud-based utilities for enabling the team which manages the warehouse to take instantaneous decisions on the materials stacked. Fire alert mechanisms and providing information related to earthquakes in the vicinity of the warehouse to nearby police and other agencies are provided/incorporated in the device. Information on marked variations on the weight of the contents of the stacked materials inside the warehouse can be instantaneously shared to the warehouse management team with the help of cloud services and android application and steps to curb pilferage of the contents are incorporated in the system.

**Keywords**— Internet of Things, Warehouse management, Cloud storage, Cloud services, Android application

### 1. AN INTRODUCTION TO THE INTERNET OF THINGS

IoT (that is) “Internet of Things” nowadays play a crucial role in our day to day schedule. The electronic and the device that is connected to the digital environment is increasing more than 15 billion, in equals of 2 devices per person. Suitable examples for the IoT is “Smartphones”, the smartest devices are developed with programmable and remote controlled appliances. Future growth in the Internet of Things basically from every sector of the economy like a commercial, industrial, health care and public safety. [1]

Since all the devices are connected to the network and capable of performing fewer analytical operations “Internet of Things” provides a vast gateway (i.e) it is the extension of connectivity network and robust analytical techniques.[2]

#### 1.1 Related work

The warehouse is a vast working space in which enormous factors must be taken into consideration. The technology and the importance of monitoring the temperature and the humidity level and various another gas odour at warehouse [3], the device checks for the temperature and humidity level at the warehouse and sends the data to a microcontroller board (P89V51RD2). It also predicts whether the stored amenities in the warehouse are at the correct temperature and humid level. This helps in preventing the amenities from decomposition. Based on the Bio-degradable materials like vegetable and fruits life span is less when compared to other stuff. In this type of Scenario, random sampling is taken based upon its value it sends the data to the microcontroller (P89V51RD2) it evaluates and sends a notification to the officials.

The author have designed an IOT device that can help the Warehouse officials to monitor the instant atmospheric moisture, Temperature [3] of vegetables, fruits and other goods and other necessary details that is required for the warehouse using sensors to prevent it from decomposing The device can be used for both bio-degradable and non-bio-degradable depending upon their constraints . The collected data have been stored in a cloud.

The device also has a special security system [4] that keeps monitoring the weight of the goods using load module (SKU: SEN0160) if there is change in the weight of the goods from the initial time without the knowledge of the officials there will be alarm with alert message to the Officials with Image that has been captured from the camera and the doors will be sealed. This intelligent device is capable of sensing a theft and wastage loss in weight.

The GSM module [4] (SIMCOM SIM900A) which is present in this Intelligent device. The device (which is mounted in the warehouse) can send a periodical alert to officials who are located in remote places.

Natural disaster and security constraint in the warehouse is important to notice in case of fire accident explained in [5]. In case of Fire, theft or Earthquake or any kind of abnormal activity inside the warehouse immediately emergency alert will be sent to the nearest Fire station, Police station and to the officials with the GPS Co-ordinates for mitigation. There is a Necessary module (MQ135) (Flame detector) and In case of any Natural disaster in and around of warehouse a vibrational sensor (SW-420) data prediction is taken into consideration. The coordinates are sent using the GPS module attached to the microcontroller (P89V51RD2)

Here the device gets upgraded [6], the data that is being fetched from the intelligent device is stored in cloud storage. Hence the data from the warehouse scenario is vast in size and the analytical powers required lots of storage the author adopts this technique. In warehouse monitoring [7], the cloud storage and the IoT device are integrated via an API channel through which the data that is being fetched in the warehouse are stored and few widgets with respect to the cloud services have been adopted. The cloud storage is segmented into different partitions as per the various sections of the warehouse to improve the efficiency of storage and retrieval.

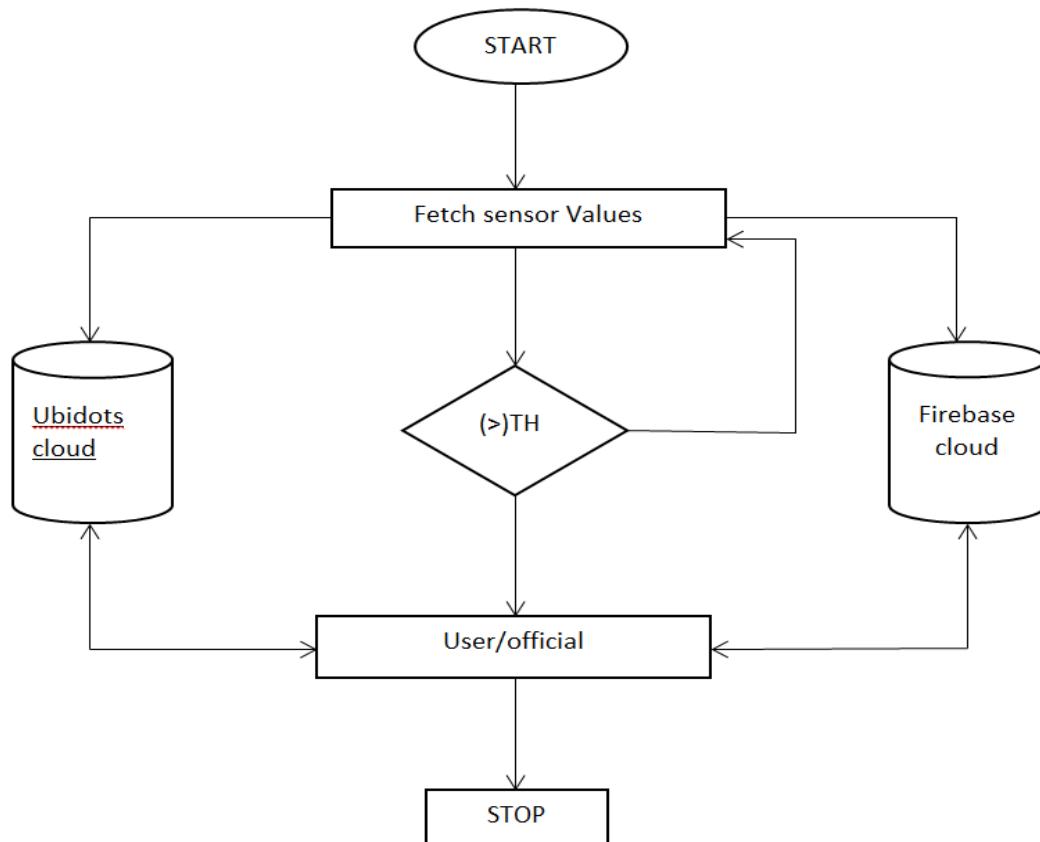
Warehouse Monitor is proposed with an Android application [8]. An Android application is designed uniquely to serve the purpose of warehouse monitoring. The data that is being fetched from the intelligent device, Emergency alerts and complete action of the warehouse is visualized in the android application. A separate app that is designed for the officials to monitor the warehouse and access the data in the cloud. The application is segmented into two major sections.

1. Officials can only access the activity by entering the four digits secret PIN to ensure the hackers do not provoke any illegal activities.
2. The activity that provides a chart in which a user can visualize, the number of raw materials that has been unloaded from the warehouse.

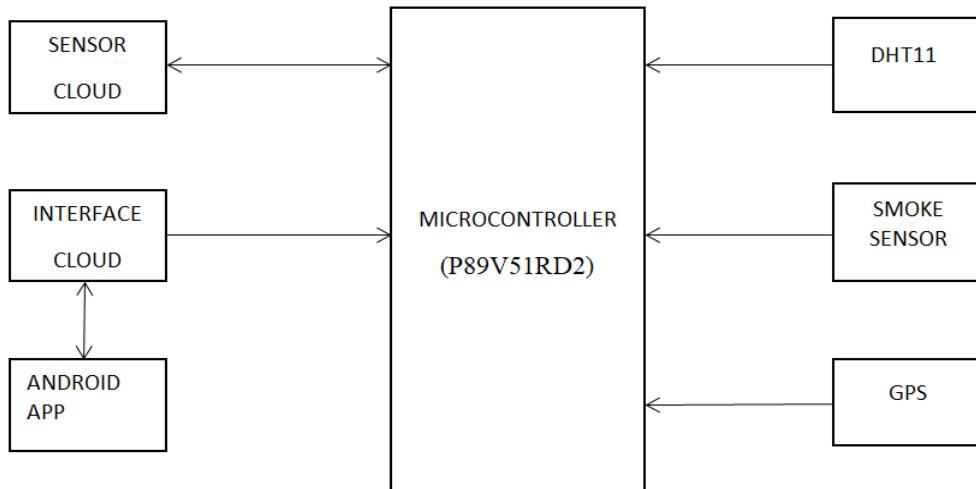
Here the warehouse monitor also plays a major role in supply chain management [9], since all the loading and unloading weights have been measured in the warehouse it is visualized using an android application the supply chain (that is) the link between the warehouse and the hub provides a safe and unchanged quantity of goods. The number of goods that are available in the warehouses will be stored in the cloud. We can use this data in the cloud in case of natural disaster for food supply.

Warehouse Monitor is proposed as centralized bot [10], An IoT devices that serve to the nook and corner that is every aspect with respect to the warehouse. It also helps in maintaining and monitoring the factors with fewer manpower.

Here the Warehouse monitor [11] provides a dedicated firebase cloud to transfer more vital data between officials with respect to the regional demands. The coordinates of every warehouse, bio-metric credentials are being stored under firebase.



**Fig. 1: Flow graph of warehouse monitor**

**Fig. 2: Block diagram of the warehouse monitor**

## 2. CONCLUSION

A device for managing the contents of a Warehouse , combining of an IOT ( Internet of Things) based system, the said device can help the Warehouse managing team to monitor the parameters of the contents of the materials stacked in the warehouse, instant atmospheric moisture, temperature of vegetables, fruits and other goods and other necessary details that is required for the warehouse using sensors to prevent it from decomposing, the said device can be used for both bio-degradable and non-bio-degradable depending upon their constraints. The device for managing contents of warehouse, is incorporated with a GSM (Global System for Mobile) module which is present in this IOT device (which is mounted in the warehouse) can send periodical alert to officials who are located in remote places wherein data that is analysed and sent from this intelligent device is also stored in a cloud storage and can be segmented into different partitions as per the various sections of the warehouse to improve the efficiency of storage and retrieval. The device for managing of warehouse contents is adapted for sending emergency alert prompts case of occurrence of Fire, theft / pilferage or Earthquake to be sent to the nearest Fire station, Police station and to the warehouse management officials with the GPS Co-ordinates for quick and prompt action to douse the fires through necessary sensors and data analytical strategies which can be pressed into service for achieving this. The device for managing of warehouse, wherein a special security system is incorporated whereby, constant monitoring the weight of the goods is enabled and if there is change in the weight of the goods without the knowledge of the warehouse managing team, alarm prompt with alert message to the Officials can be sent with Image that has been captured from the camera and there is provision for the doors of the warehouses be sealed to secure the materials from being taken out by unauthorized persons and check possible pilferage. An Android application is designed with an easy to use GUI is provided so easy access to the warehouse area can be done without being present at the respective warehouse helps in reducing the manpower that is being vastly used in warehousing.

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