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ON-TIME ORDER EFFORTLESS REPLENISHMENT ORDERING OF MERCHANDISE USING INTERNET OF THINGS

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Abstract

The internet has changed almost every aspect of our lives, how we work, think, educate and entertain ourselves. The Internet of Things connects more devices and impact more than anything ever before. This project aims to create a system that reorders products as and when their consumption rate begins to rapidly increase than the normal consumption rate. Each load sensor used in this system is paired with a product of your choice during the set-up process. With this setting, the device is programmed in such a way that it automatically detects and notifies the user about the product that runs out and will not place a new order until prior confirmation from the user is received. In addition, the user will also receive an order notification for every order placed thereby ensuring order protection and easy usage. The placed order is then submitted to the nearby store

and with the due course of time based on the product availability, the product will be delivered at the doorstep of the user. The preferred mode of payment in this system is cash on delivery. This way, this system serves to be of immense importance to a lot of people.

***Key Words*:**Internet of Things, Order, Load Sensor, Product

1 INTRODUCTION

This project is based on the concept of connecting the inanimate objects to the users via the internet. Though replenishment ordering is the most common work of every household, it has no technology to ease out the efforts associated with it. This system aims to reduce any minimal work of human involved with it to increase the quality of time and living. This system uses the integration of the HX711 microcontroller, load cell(that can be placed on any product) and wi-fi transceiver that senses and analyses the load of the product and notifies the server as and when a minimal weight is detected. The server notifies the user regarding the same. The system is also designed in such a way that the user can place the order for the corresponding product in just a click. This placed order is then reported to the nearest shop and the product shall be delivered at the door-step of the user.

2 RELATED WORK

This paper proposes a Cloud-centric platform offering efficient inventory management as a service for supply chain stakeholders. The offered service will enable all stakeholders in a supply chain to minimize both their ordering costs and their shortage costs, while managing their inventories. The proposed cloud-based platform stores all the data, relating to a given product item, released by the involved stakeholders throughout its life cycle; from its manufacture up to its retail, passing through its distribution, storage, etc. The objective of the offered service is to provide stakeholders, in a supply chain, with efficient replenishment schemes derived collaboratively on the basis of real-time information flow, including

retail information. A stakeholder calls the proposed service in order to compute a real-time optimal inventory threshold, with regard to a given product category, to be considered in its replenishment policy. By optimal they mean that it minimizes the stock disruption likelihood, while minimizing the allocated resources in term of storage space and inventory cash value. The computation of the optimal parameters is based on a probabilistic model. Analytical results illustrate the efficiency of the inventory optimization service offered by our proposed cloud-centric platform[1].

Generally, middleware can make easy the development process by integrating heterogeneous computing and communications devices, and supporting inter-operability within the diverse applications. Of late, there have been a number of proposals for IoT middleware. These proposals addressed Wireless Sensor Networks (WSNs) which is an essential component of IoT. But they did not consider Radio-Frequency IDentification (RFID), Machine-to-Machine (M2M) communications, and Supervisory Control and Data Acquisition (SCADA), which are the other three core elements in the IoT vision. In this article, a set of requirements for IoT middleware is outlined. They also present a comprehensive review of the existing middleware solutions against those requirements. In addition, open research issues, challenges and future research directions are also highlighted here [2].

Since the America brought up the concept of the Smart Planet, there has been more and more attention put on the Internet of Things (IOT). In the present work, they introduce the origin and background of the IOT. At the same time, it expounds the principal and technologies of IOT and analyzes its enormous market potential in the Green application, pointing out that IOT is another technical revolution in the global information industry of science and technology after the Internet. Especially in the background of the global financial crisis, IOT will become the new economic growth pole and bring new impetus for economic growth[3]. Changing times have demanded the change in conventional working models. The large scale use of Internet and its related technologies like Internet of Things has widened the horizons of their applications. However, the actual realization of Internet of Things (IoT) can be made possible only through the readily available location-independent services like the Cloud computing. There are various considerations while adopt-

ing Cloud services in IoT. This paper aims to present the role of cloud computing services in IoT implementation and how they are most suitable for Internet of Things concept. It explicitly defines those parameters from the point of view of IoT implementation and performance [4].

Here, they present a low-cost IoT based system that can monitor acoustic, olfactory, visual and thermal comfort levels. The system is provided with different ambient sensors, computing, control and connectivity features. The integration of the device with a smart-watch makes it possible the analysis of the personal comfort parameters[5].

Amazon provides a complete set of IT tools for organizations to create dedicated virtual clouds for retaining complete configuration control over their environment. Amazon Web Services[1] can service for both organizations and IT developments. The cost benefits and efficiency of moving to the cloud make it appealing to security professionals. But it introduces several transition security risks and compliance concerns. By introducing a variety of functionality and services, like dedicated Elastic Compute Cloud (EC2) instances, which promises to make cloud computing safe for highly regulated companies, Amazon Web Services (AWS) has tried to alleviate enterprise security and compliance concerns with cloud computing[6].

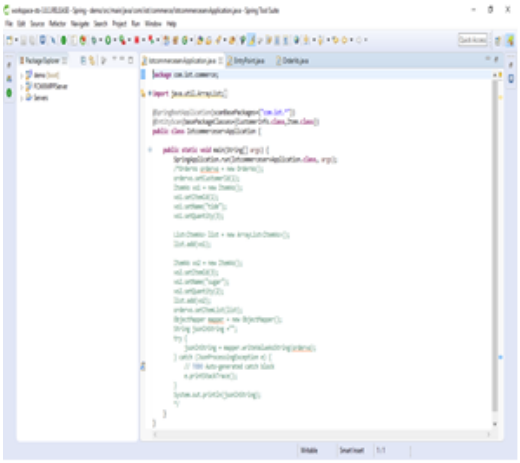
3 SYSTEM MODEL

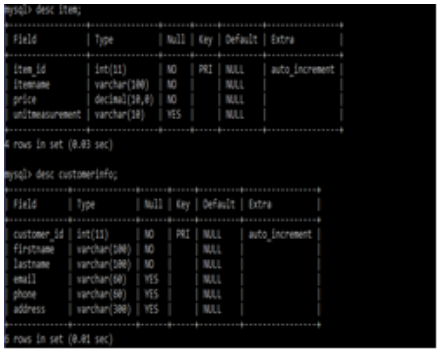
3.1 Creation of database and retrieving merchandise information

This system uses cloud technology for storing and retrieving information. It uses the mysql database to store the information regarding the product details, order details and customer details. The product details include the item ID, item name, price and unit measurement. The order details include the order ID, customer ID, item ID and quantity. And the customer details include the customer ID, customer name, email ID, contact number and the address.

The software is stored in the amazon based cloud service.. Amazon packages AWS with scalable and virtually unlimited comput-

ing, storage and bandwidth resources. Amazon EC2 and Amazon S3 are two core Infrastructures as a Service (IaaS) services. These are used by cloud application solution developers worldwide.





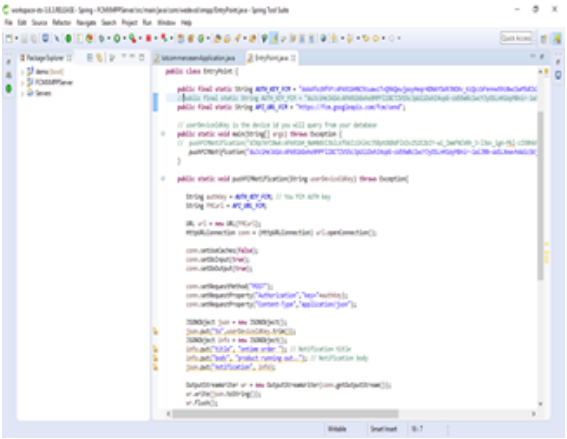
```
mysql> desc item;
+---------------+-------------+------+-----+---------+----------------+
| Field         | Type        | Null | Key | Default | Extra          |
+---------------+-------------+------+-----+---------+----------------+
| item_id       | int(11)     | NO   | PRI | NULL    | auto_increment |
| itemname      | varchar(100)| NO   |     | NULL    |                |
| price         | decimal(10,0)| NO  |     | NULL    |                |
| unitmeasurement| varchar(10)| YES  |     | NULL    |                |
+---------------+-------------+------+-----+---------+----------------+
4 rows in set (0.03 sec)

mysql> desc customerinfo;
+-------------+-------------+------+-----+---------+----------------+
| Field       | Type        | Null | Key | Default | Extra          |
+-------------+-------------+------+-----+---------+----------------+
| customer_id | int(11)     | NO   | PRI | NULL    | auto_increment |
| firstname   | varchar(100)| NO   |     | NULL    |                |
| lastname    | varchar(100)| NO   |     | NULL    |                |
| email       | varchar(60) | YES  |     | NULL    |                |
| phone       | varchar(60) | YES  |     | NULL    |                |
| address     | varchar(300)| YES  |     | NULL    |                |
+-------------+-------------+------+-----+---------+----------------+
6 rows in set (0.01 sec)
```

The main program is written in Spring language. When the pressure sensor detects the product run-out, the Iot Commerce(main program) begins its execution. It incorporated the activities of fetching the price from the database to display it to the user. Based on this, the user may prefer to place the order with just a click.

3.2 User-Merchant notification through cross platform messaging

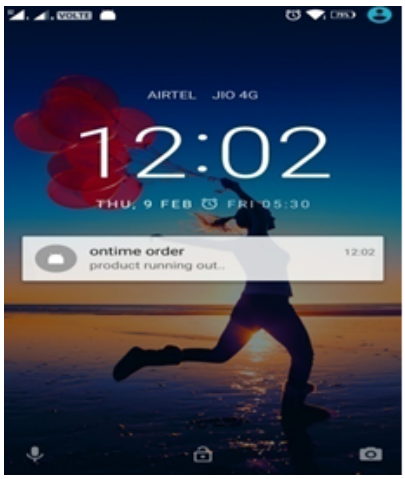
As and when the sensor detects the product run-out, it sends the notification to the server regarding the same. The server notifies the user through the FCM based technology. Firebase Cloud Messaging (FCM) is a cross-platform messaging solution that lets you reliably deliver messages at no cost. A client application can be notified that a new email or data is available for synchronization using FCM. You can send notification messages to drive user reengagement and retention. Through FCM, one can send notification messages to various devices at the same point of time. Hence, it is also termed as Versatile Message Targeting. It can also be used to send messages from client apps. On-Time Order uses this technology on a Spring based platform to establish the necessary connections.

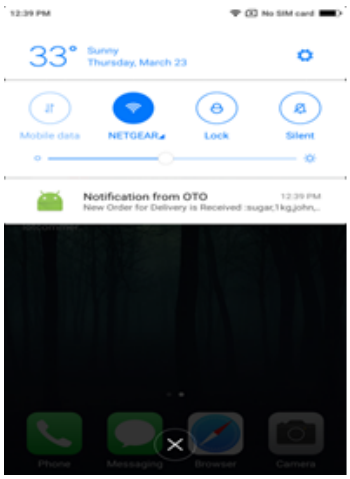


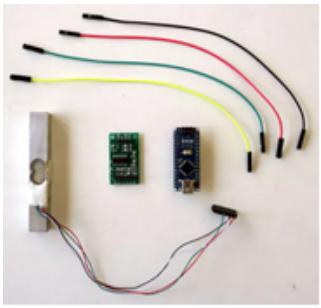
Once the sensor senses the product run-out, the main program is triggered. Then the server sends the product details to the user through FCM. The phones build up details are stored in the FCM cloud, making it easier to detect the order placed from the particular device. The same process is used in the merchant side where the merchant receives the customer information such as the customer name and address along with the product ordered.

3.3 Analysis of load and report to server

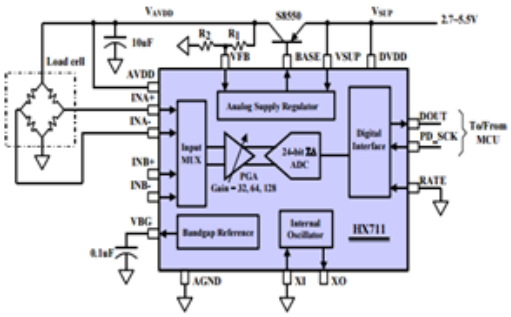
This module uses the hardware components such as HX711 load cell amplifier, load cell. These components need to be integrated together to analyze the reducing weight of the product and is programmed in such a way that the server is notified automatically regarding the same.



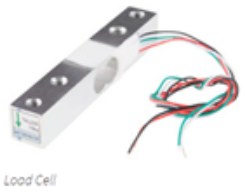




On the basis of Avia Semiconductors patented technology, HX711 is a precision 24-bit analog-to-digital converter (ADC). It is designed for weigh scales and industrial control applications to interface directly with a bridge sensor. There is no programming needed for the internal registers. All controls to the HX711 are through the pins. Its applications include weigh scales and industrial process control.



A load cell is a transducer that is used to create an electrical signal whose magnitude is directly proportional to the force being measured. Various type of load cells used here include hydraulic load cells, pneumatic load cells and strain gauge load cells. Load cells are used in several types of measuring instruments such as laboratory balances, industrial scales, platform scales and universal testing machines.

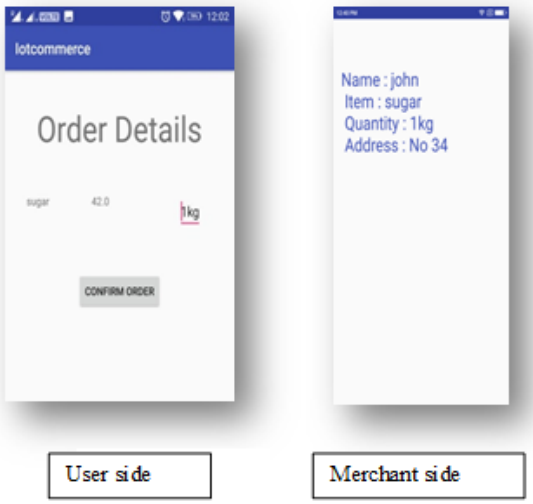


Node MCU is an open source IoT platform. The term "NodeMCU" refers to the firmware and not to the development kits. It is an open-source, interactive, programmable, low cost, simple, smart, wi-fi enabled.



3.4 Development of application interface

The android application is created at the user end as well as at the merchant end. This app acts as an interface which helps in placing the order(by the user) and receiving the order(by the merchant). The app can be created at two levels. At the user level, it contains the fields such as the product name, product price and the unit measurement. This helps the user to place the order from any place. At the merchant level, it contains the fields such as the customer name, customer address and the product ordered. This helps the merchant to deliver the product at the customer door-step.



4 Conclusion

The android application is created at the user end as well as at the merchant end. This app acts as an interface which helps in placing the order(by the user) and receiving the order(by the merchant). The app can be created at two levels. At the user level, it contains the fields such as the product name, product price and the unit measurement. This helps the user to place the order from any place. At the merchant level, it contains the fields such as the customer name, customer address and the product ordered. This helps the merchant to deliver the product at the customer door-step.

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