

Automatic Smart Inventory Asset Management System

Bonala Harika¹, Padegal Madhuri², Dr. R. Vasanth Kumar Mehta³

¹Student, Dept of CSE, SCSVMV (Deemed to be University), Kancheepuram, Tamil Nadu, India

²Student, Dept of CSE, SCSVMV (Deemed to be University), Kancheepuram, Tamil Nadu, India

³Associate Professor, Dept of CSE, SCSVMV (Deemed to be University), Kancheepuram, Tamil Nadu, India

Abstract - An In general, warehouses are used to store goods or products that are very difficult to locate because the user has to do detailed searches manually. So, to avoid this problem the inventory management system is helpful.

In this article we have implemented the inventory management system with IOT along with the RFID as it is more efficient for the warehouse inventory management system and also we built the web interface which is built in accordance to provide a convenient interface to the user to track the product. The RFID tag information is transferred from transmitted section to open the hardware. The inventory management system built on the architecture of the Internet of Things is developed to track the product attached to the tag with product information. The developed system results a very low cost system and works dynamically compared with existing system

Key Words: IOT, Arduino, RFID, Java, MySQL.

1. INTRODUCTION

Inventory management is very helpful for various industries as it reduces the manual work, time required. and also it handles various data that include serial no, cost of products, quantity of products and helps to keep track of these data throughout the process.

1.1 Problem Statement

Some Industries use barcode systems and some use human capital to maintain the stock and check for the availability. Industries which use human capital will require more time, this time can be reduced by using barcode systems but still in this system human intervention is required and also the objects need to be in line of sight. Involvement of humans has to be reduced and the system should work dynamically

1.2 Existing system

Generally, in every industry the existing system is a manual one in which users are maintaining ledgers, books etc. It is very difficult to keep track of various information like availability of goods, availability of various categories and details of each good.

Drawbacks of existing system:

- It is difficult to handle and maintain every important information manually.

- More manual time required to keep track of goods.
- It is very complicated to manage the historical data of goods manually.
- Daily history of stocks needs to be entered into different books manually to avoid clashes which are very hard to manage.

In Existing Barcode systems, the problem is it involves a lot of manual work and objects need to be in line of sight with the reader which is very complex with multiple objects that need to be scanned. To overcome this, RFID is used which can read several objects even if objects are not in line of sight with the reader.

Table 1: RFID vs Barcode

Features	RFID	Barcode
Read Rate	Several tags can be read at one point of time	Only one tag can be read at a time
Line-of-Sight	Not Mandatory	Mandatory
Workforce	In RFID, we require the less human capital because it is completely automated.	Large capital is required, because here each tag has to be scanned manually.
Ability to read and write	RFID allows to read, write, modify and update	Barcode only has reading ability.
Stability	RFID is highly stable, because it can be used to read tags in any kind of environment.	Barcode is less stable, because it gets damaged easily.
Security	RFID is highly secure, because it is very to replicate.	Barcode is less secure, because it can easily forger.

1.3 Challenges and Issues

- *Human error :*

In general the task supervisor makes use of spreadsheets to store the information of assets but it is only available on the work PC. This involves a lot of human work which might also lead to more errors.

● **Maintenance issue:**

The stock of every industry has to be maintained efficiently otherwise it leads to some consequences

- ❑ Overtime of labor due to downtime
- ❑ Material Wastage
- ❑ Equipment before the end of its useful life.

● **Wrong inventory Estimation:**

Determining the right amount of stock can be a tricky decision. For example, like hospitals, keeping the stock of medicine is very important. If a situation like out of stock or expiry of the medicine might lead to the difficult situation.

However such cases can easily be avoided with the assistance of inventory tracking.

1.4 Solution

To reduce the involvement of humans we implemented a process with the help of IOT and RFID because RFID tags are attached to each product and using an RFID reader we can read multiple tags at one point of time.

This solves the problem to the maximum extent which reduces the time required and increases the efficiency.

2. ARCHITECTURE

To implement the inventory system we followed the IOT architecture framework which specifies the physical components of a network, its organization and functional configuration, its principles and operational procedures and the data format used in its operation. IOT architecture is defined in five layers:

Perception Layer:

This is also known as device layer and this layer mainly consists of physical objects and devices such as RFID, barcode, infrared sensor.

For our management system we used RFID to identify the information and collection of data from the device. The collected information is then passed to the Network layer for the secure transmission.

Network Layer:

It is also known as the Transmission layer and this is responsible for transferring the information from the devices to the information processing system. The medium of transmission may be wired or wireless.

It generally transmits the data generated by an IOT device and its communication with a local server or cloud.

Middleware Layer:

IOT system is a collection of devices which implements different types of services and each device interacts with the other device only if they both implement the same kind of service. Main implementation of this layer is to create a link to the database and to manage the services.

This layer processes the information and makes automatic decisions based on results.

Application Layer:

Based on the information received from the middleware layer, the application layer provides a system which can be managed on any device.

Business Layer:

This is the top most layer in the IOT architecture and it will manage the applications and services and it will develop the models and graphs that will help for the future actions and business strategies. It is responsible for presenting the data generated by the IOT device for user interaction.

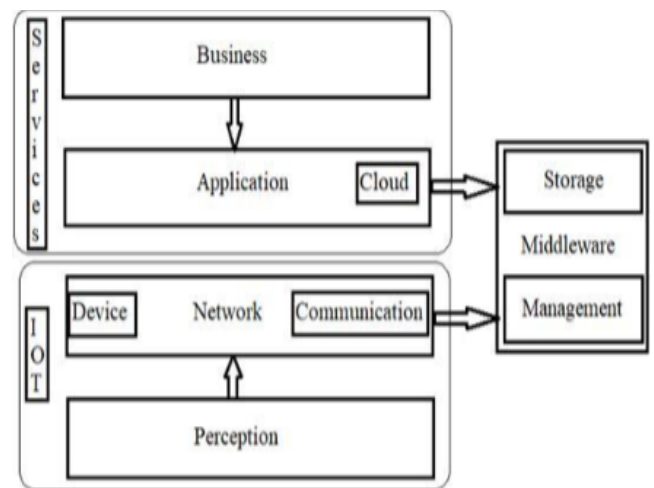


Fig 1: Architecture

RFID uses radio waves to read the information which is stored on the RFID tag. RFID readers can read the tag without line of sight, which is several feet away. The RFID system is made up of two parts: a tag and reader.

RFID tags contain code called Electronic Product Code(EPC) which is unique for every tag. There are three types of tags: we can use any of the tags according to our requirement, they are active tag, passive and semi-passive tag.

- Active tags have an internal battery which provides a power source. These tags are costlier and can be identified at greater distance when compared to other two tags
- Passive tags do not contain a power source on their own, but it can be generated by transforming the energy of the radio frequency signal of the RFID reader. Passive tags are cheaper.
- Semi-passive tags contain an internal battery, which gets activated by receiving a radio frequency signal by the RFID reader.

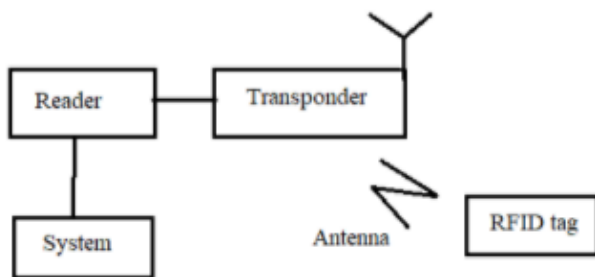


Fig -2: RFID System

RFID reader reads the RFID tag that contains details of the product when it comes into the region

3. IMPLEMENTATION

The following are we used for implementation

- Java
- MySQL
- Eclipse IDE
- RC522 RFID module
- RFID tag
- Arduino

These are the details of every product that are used for project implementation

- Tag No
- Product Name
- Brand
- Model
- Item count
- Manufacture

- Bank details
- cost

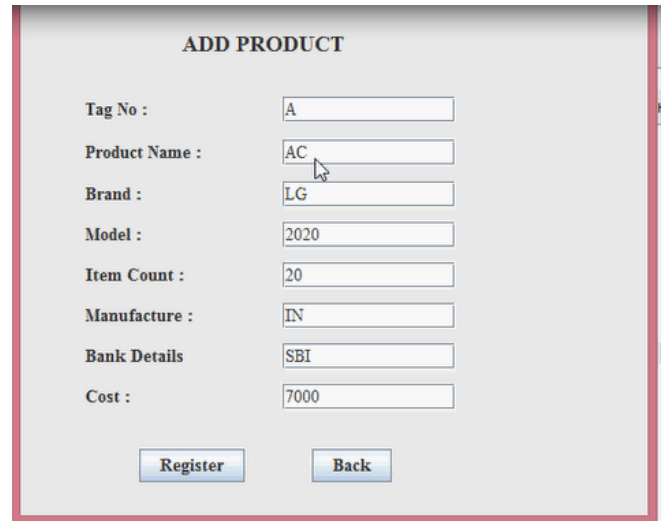


Fig 3: Product Details

- Once the user purchases the product the minimum balance will be reduced, and available stock of that particular product gets updated.

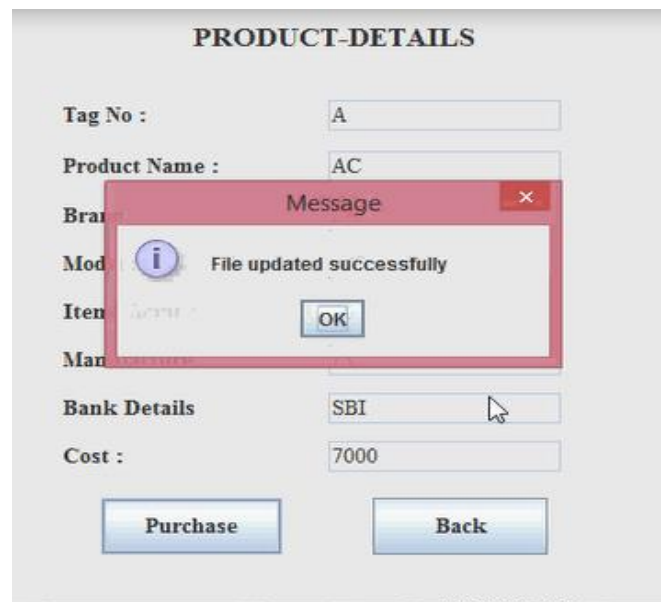


Fig 4: Add product

- This will help the industries to manage their stock without any manual work.
- If a user does not have enough balance to make the purchase, then an **insufficient balance message** will be popped up.

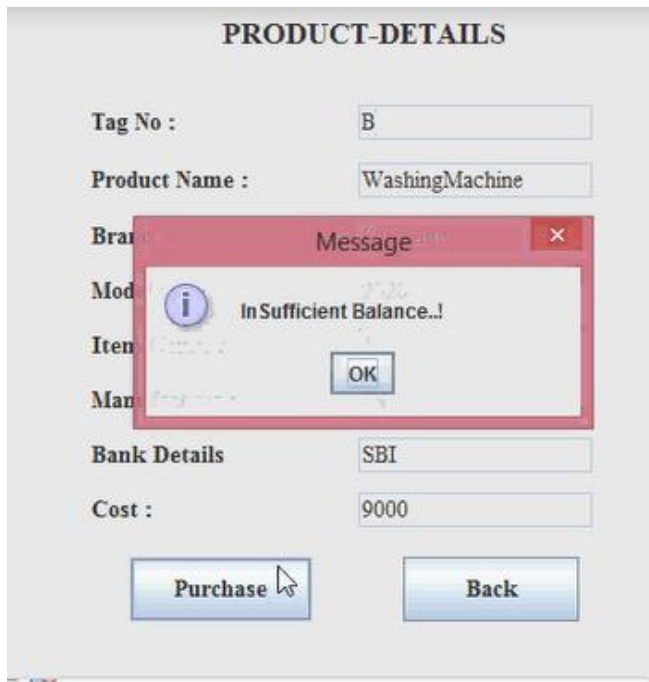


Fig 5: Insufficient Balance

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4. CONCLUSION

In this article, we have implemented an inventory system with IOT and RFID. This system provides regular insight into the stocks by providing real time information that is read using RFID tags. It helps to keep track of various details of stock like quantity and category. This reduces manual work and time required.

Scope for further development:

We will make this into a fully functioning system which can be used for any kind of industry by customizing the stock details according to their necessity.

This system can be developed visually by adding bar graphs, pie charts which help to visualize efficiently.

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