Database Management Systems Project

CSE2004

AUTONOMOUS POINT OF SALES RETAIL SYSTEM

Submitted By:

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1. Abstract

In today's world, it's a hassle to stay in a queue and pay for commodities at a billing counter. Especially since "time is money" we shouldn't be bothered by such time-consuming ordeals. As a solution to this problem our team is indulged in developing a system that eases the process of bill payment along with avoiding human error substantially at these payment counters. Our system enables individual customers to scan and select items at their free will which in turn makes the checkout process more efficient. Customers also gets the facility of a wallet system which enables seamless transactions at the counters. For the enterprise administrators/managers multiple features have been allotted, like inventory management, sales analysis and accounting, employee and customer management. The client and server procedures are well established.

2. Introduction

2.1 Objective

To develop fully autonomous and cashier less point of sales system with centralized database.To improve checkout efficiency by implementing self scanning facility for customers.

To implement cashless payment interface by introducing a market wide digital payment system.

To enable administrators and managers by providing features like inventory management, sales analysis and accounting, employee and customer management

2.2 Motivation

This project is directed in such a way that the consumer has full access to his or her product line management. We have taken up this project to solve the issue that has bothered a lot of customers and by providing them with such solutions we are able to suffice the needs of the public in adequate manner. This project is intended to be served as a reference material to other users who have the at most interest in developing solutions to worldly problems.

2.3 Issues in Existing system

2.3.1 Long queues at counters.

2.3.2 Cash payments which require exact change to be returned.

2.3.3 Human error in payment counters.

2.3.4 Lack of proper sales analysis patterns

3. Literature Survey :

1. Project Title-Smart Shopping Cart, Authors- Akshay Kumar1, Abhinav Gupta1, S Balamurugan1, S Balaji1 and Marimuthu R1* 1School of Electrical Engineering, VIT University, Vellore ,Publication-IEEE

2. Project Title-Wireless Point Of Sale Terminal for Credit and Debit Payment Systems, Authors-Andrej Zdravkovic Omega Digital Data, Concord, Ontario, Canada

3. Project Title-A Secure Wireless Point of Sale System- Carl J. Debono Department of Communications and Computer Engineering University of Malta Msida, Malta c.debono@ieee.org

4. Project Title-Security Enhancement Methods for Mobile POS System – Authors-Dojun Yang Software R&D Center Samsung Electronics Suwon, South Korea dojun.yang@samsung.com

5. Project Title-A Review on Automated Billing for Smart Shopping System Using IOT, Author-1 P.G. Scholar, Department of Information & Technology, RTMNU University, Nagpur, Maharashtra 440033, India 2 Tulsiramji Gaikwad Patil College of Engineering Technology, Nagpur, Maharashtra 441108, India

3.1. Smart Shopping Cart

This system makes use of two Arduino Uno microcontrollers. One of the Arduino is interfaced with an LCD, XBee module and a RFID card reader. The other Arduino which is acting as a central database of all the products is interfaced with a single XBee module which is responsible for communicating with the cart. -Methodology: An advantage for the shop owner is that there is reduced amount of man power required at the billing counter. Hence, the Smart Shopping Cart stands apart from existing designs. -Advantage

3.2. A Review on Automated Billing for Smart Shopping System Using IOT

The RFID power-driven electronic shopping trolley is built to improve the complete shopping understanding for computer electronics store consumers. Every last trolley is joined with a RFID reader per user. The context work is the idea at which the purchaser buys a thing, the purchaser must be inspecting the thing first with help of identical tag are available in each item using the RFID per consumer-Methodology

Advantages

Existing System	Proposed System
Manual billing	Automatic billing
Using Bar code for billing	Using RFID for billing
Human supervise needed for billing	Human supervise not needed for billing

Disadvantage The disadvantage of this scheme is after completion of shopping, a key is pressed indicating the final promoting amount of the entire item, and we can't add or remove the products.

3.3. A Secure Wireless Point of Sale System

Methodology: The system requires an application running on the mobile phone, a POS personal computer (PC), a common network which can be the Internet, a transaction handling system, and the banking system. Advantages: The main advantage of this solution is that the mobile phone does not need a separate connection to the Internet, thus avoiding additional costs. However, this raises security issues since the data can be sniffed by the POS PC or any node in between the POS and the transaction server. Disadvantages: Different scenarios were emulated for both valid transactions and non-valid ones, such as when the link between the mobile device and the POS PC fails, or there is an error in the data.

3.4. Wireless Point Of Sale Terminal for Credit and Debit Payment Systems

The credit and debit card payment processing systems have three main components: POS terminal to read and process card data A communication system to transfer financial An authorizing host computer ~ Methodology The obvious advantage of the AMPS technology is the nationwide coverage far better than any other wireless technology. However. there are some major concerns with this solution: Long connection time; High price associated with every transaction; No data security and privacy- Advantages: The main drawback of the conventional POS approach is the assumption that the point of service is also the point of sale. Wireless technology brings the POS terminal to the point of service.

3.5.Security Enhancement Methods for Mobile POS System

The sensitive CHD to be protected in a smartphone as a contactless card reader is considered to be PAN (Primary Account Number), cardholder name, expiration date, service code, CVC (Card Verification Code) and full magnetic stripe data or equivalent on a chip. Although a smartphone can be a contactless reader easily, due to limitations with the security features of mobile devices, merchants have a lot of remaining responsibilities to protect card holders' data. Methodology Payments with credit cards including mobile and contactless have significant advantages in transaction speed and convenience - Advantages However, due to openness of mobile devices' platform and their susceptibility to malware, the EMV kernel module running on a smartphone's processor could be attacked and as a result CHD can be easily compromised by a security attack.

4.1 Proposed system

1. Single Database Multi-User Accessibility

2. Easy Set-up Across Different Platform

3. N-User Connectivity

4. Open Source

5. Fast and Robust

   Advantages

6. Robust and Efficient

7. Fast and Secure Transaction Processing

8. Powerful Administration Management tools

9. Multi-tier Application-Database Interconnectivity

4.1 Overview

1. This system is targeted to reduce the Queue at a billing counter in a shopping complex. The system does the same by allowing the users to scan the products they like and proceed towards a payment kiosk for finalizing their transaction. In this way the customer can directly pay the amount at the billing counter and leave with the commodities he/she has bought through an automated system.

2. It eliminates the traditional scanning of products at the counter and in turn speeds up the entire process of shopping, also with this system the customer shall know the total amount to be paid and hence can accordingly plan his shopping only buying the essential commodities resulting in enhanced savings. Since the entire process of billing is automated it reduces the possibility of human error substantially.

3. Also, the system has a feature to delete the scanned products to further optimize the shopping experience of the customer. The customer software is a mobile application which can be used on various platforms.

4.2 Functional and System Architecture:

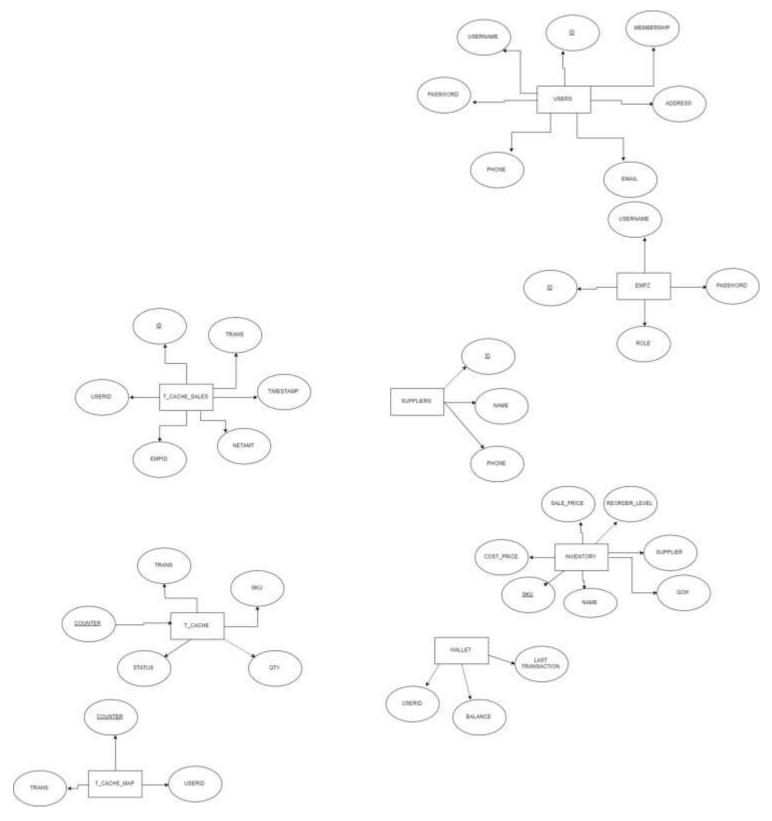The Entity Relationship Diagram with their attributes are given below:

Fig 4.2.1: Entity Relationship Diagram

Here in Fig 4.2.2, We see the Client Server architecture where the Customer application connects to the database server and also the enterprise management or the shop application also connects to the same server. The table t_cache is used to interlink the applications across the system
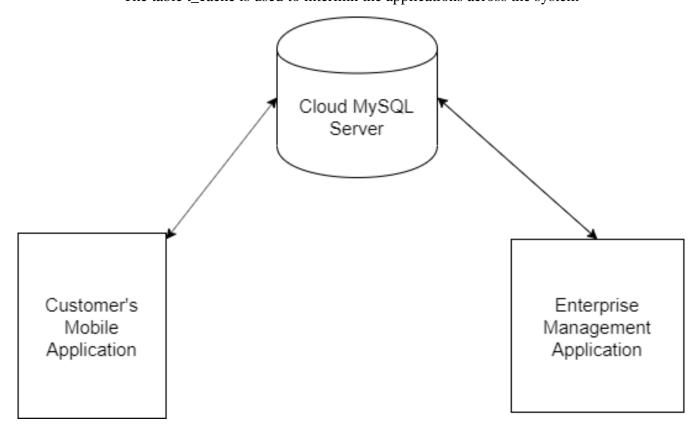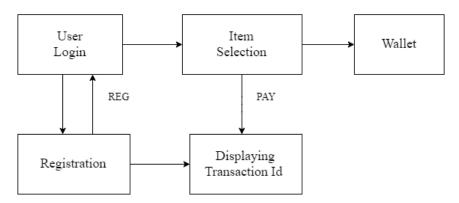


```
Cloud MySQL
   Server


Customer's                    Enterprise
  Mobile                      Management
Application                   Application
```

Fig 4.2.2: System Architecture

4.3 System Technicalities:

The system runs on both the client and server side and the database system can run on the cloud which enables both the server and the client to connect to the server. The Database server used is a MySQL server running on MariaDB which is hosted on the Apache web server for cloud access. The customer application runs on java which is cross platform and runs on various client systems. The backend/management/enterprise applications run on the Microsoft .NET redistributable framework on Windows OS.

4.4 Modular Design:

USER

(a)Fig4.4.1: User Module – *Used by Customer to Select required products, see wallet balance.* User Accounts management module maintain the information about all the customers like item selection, wallet information. This information is very useful for successful market.
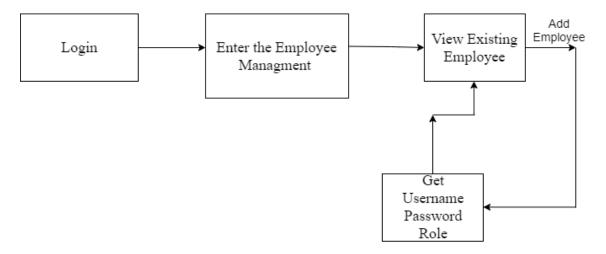

(b)Fig4.4.2: Billing Module – Used at the Enterprise Kiosk to Process the users transaction automatically. In this module we check if the user wallet is greater than the amount which user is going to spend and if it proceeds then the bill amount will be debited from the users wallet and then the SKU value is modified

SALES

(c)Fig4.4.3: Sales Module – Used by administrators for sales analysis here it displays the recent sales which has happened and the details of the items which have been bought by the customer.

EmployeeManagment

(d)Fig 4.4.4: Employee Management Module – Administrators can add new Employees with 2 access roles: admin and worker. Workers have access to only the billing module while admin has system wide access.

WALLET

(e)Fig 4.4.5: Wallet Module – The administrator uses this module to add funds to the users which they can further use for processing their own transactions. With this the user can buy items from the inventory and thus proceed with the shopping.

Supplier

(f)Fig 4.4.6: Supplier Module – The supplier is used to add new suppliers and view suppliers which is used to add/update product items.

INVENTORY

Fig 4.4.7: Inventory module – It is the core of the Store. It is where all the products are stored, and their values are recorded. Administrators can use this to add/update/delete products

4.5 Innovative Idea

Compared to existing systems/works,

1. Our project aims on reducing manpower and in return reduces the risk of human error.
2. Implemented with simple three-tier architecture rather than heavy processing and computer vision algorithms which are implemented in current systems.
3. Easy to use User Interface.

5.Implementation Details

The MySQL Database is configured with the tables as shown in Fig 4.2.1.

The Customer software is implemented in Java as follows:

Fig 5.1: Customer Login

Fig 5.2 Customer Billing

Fig 5.3: Quantity of Products can be edited

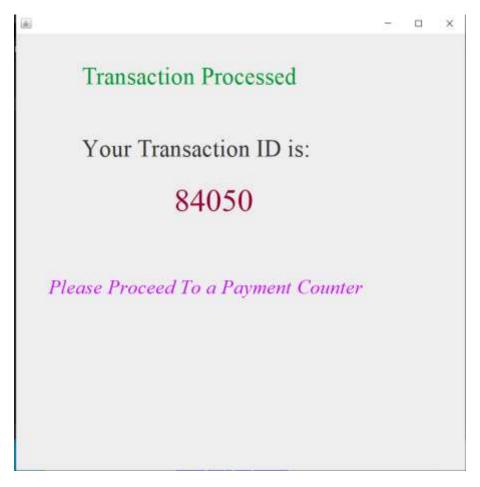

Fig 5.4: Wallet balance View

Fig 5.5: On Clicking pay button a random transaction ID is generated which can be then used at the enterprise kiosk for finalizing the transaction.

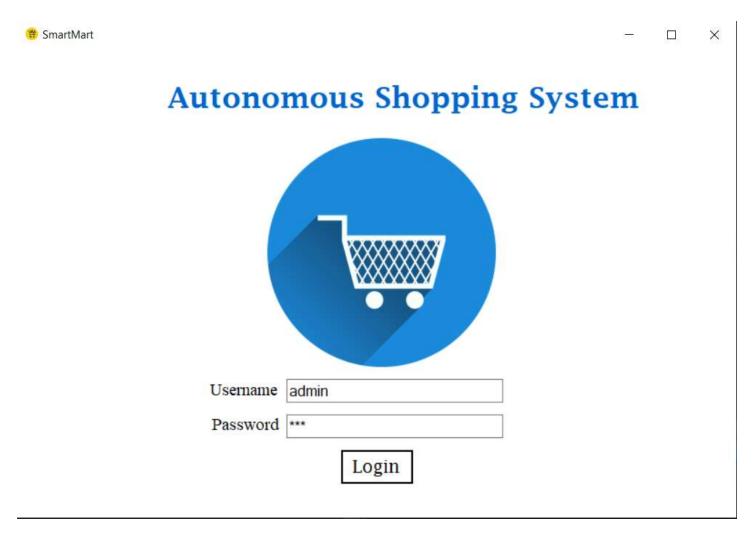The Enterprise solution is implemented in the C# .NET framework as follows:
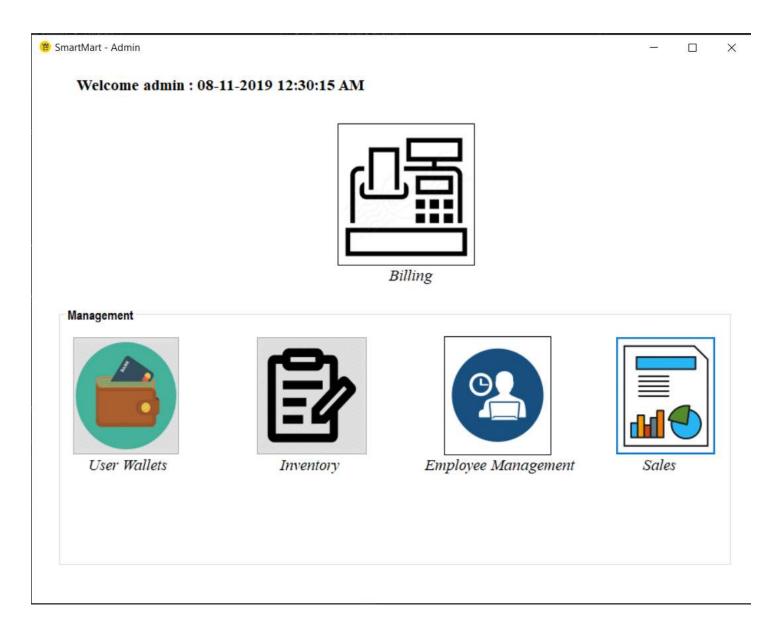

Fig 5.6: The Employee/Enterprise login page

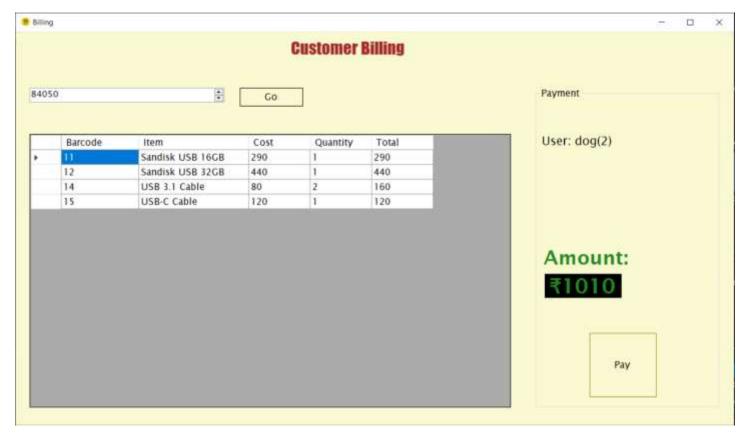Fig 5.7: The administrator control center in the software

Fig 5.8 Entering the transaction ID generated at the end of customer transaction and opening the same in the kiosk
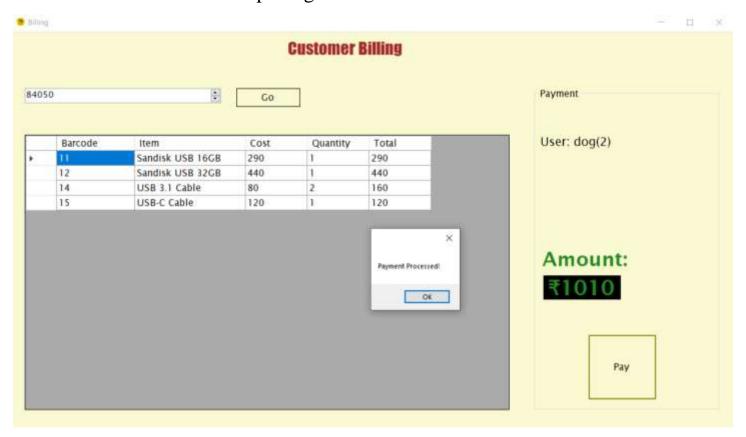

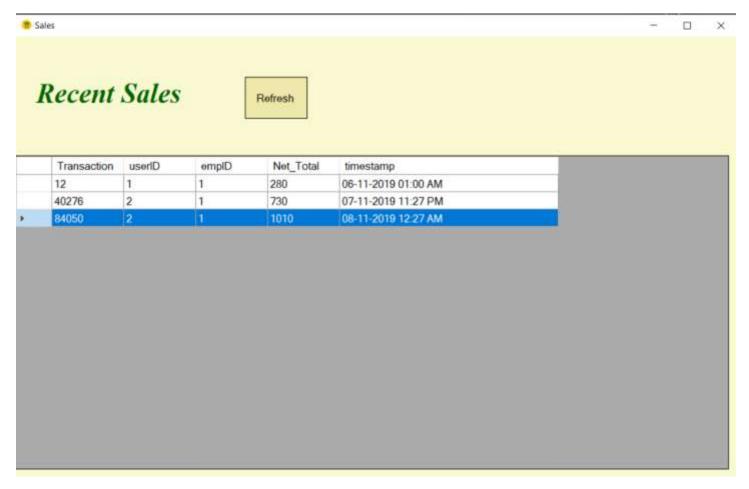Fig 5.9 Payment is processed on clicking the Pay button.

Fig 5.10 From the administrator control panel in fig 4.7 the sales sub menu opens a frame which shows the recent sales that have occurred.
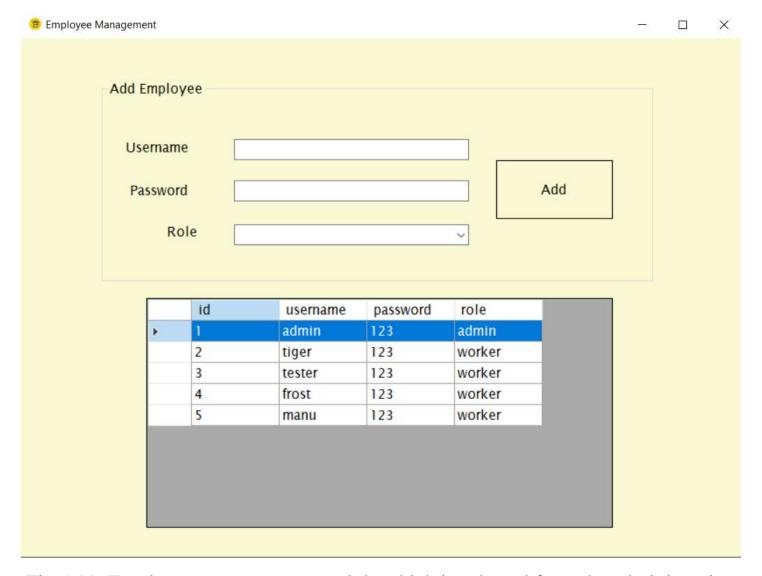
Fig 5.11: Employee management module which is selected from the administration panel in fig 5.7

Fig 5.12: User wallet management module from administration panel

Fig 5.13: Adding Funds into User wallet

Inventory Management

	sku	name	qoh	cost_price	sale_price	reorder_level	supplier
▶	3	iPhone 11 Pro	90	65000	80000	11	1
	4	Samsung LED TV	50	35000	40000	5	3
	6	MSI GS65 9SE	42	150000	165000	9	2
	10	Airpods	60	10000	11000	14	1
	11	Sandisk USB 16GB	198	220	290	15	6
	12	Sandisk USB 32GB	198	390	440	20	6
	13	Sennheiser CX 1.8	100	500	600	15	4
	14	USB 3.1 Cable	92	50	80	5	7
	15	USB-C Cable	98	100	120	5	7

Controls:
- Load
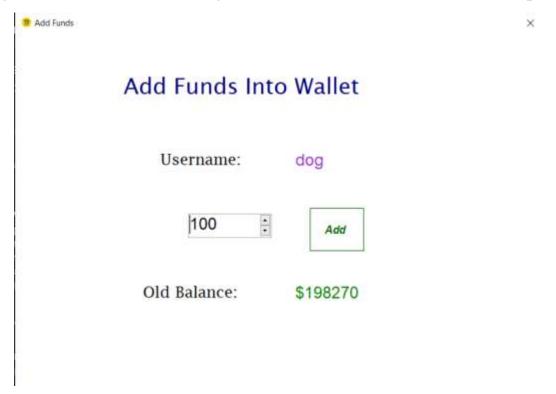- Add
- Update
- Delete
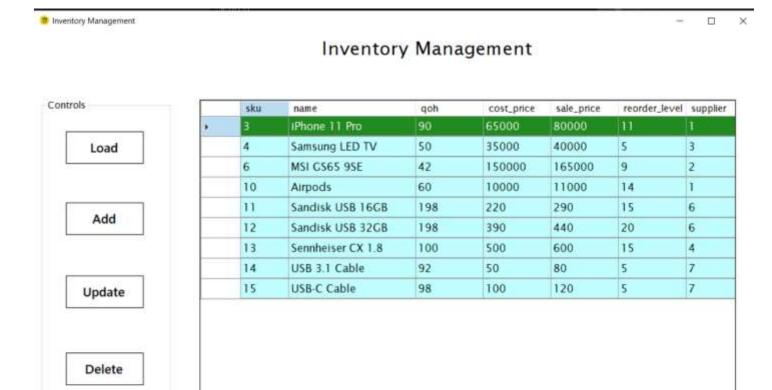
Fig 5.14: Inventory Management module which is selected from the administration control panel from fig 5.7

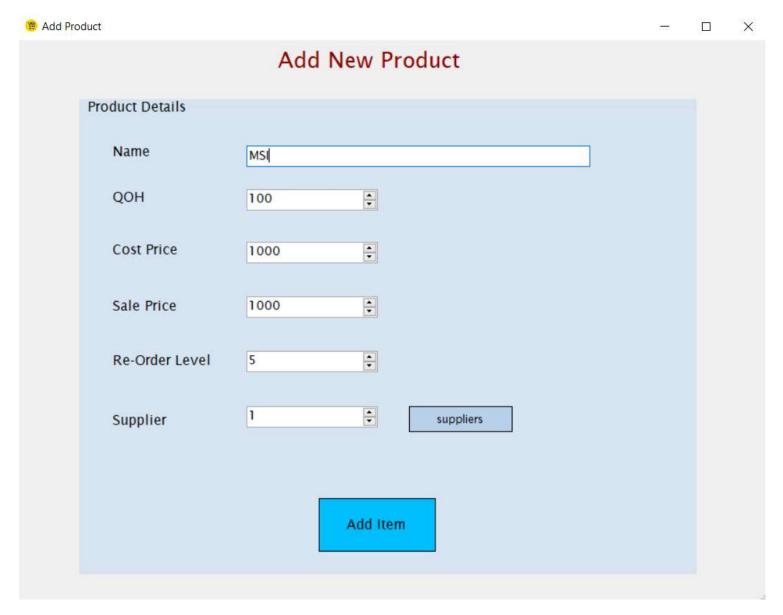Fig 5.15: Deleting products in inventory
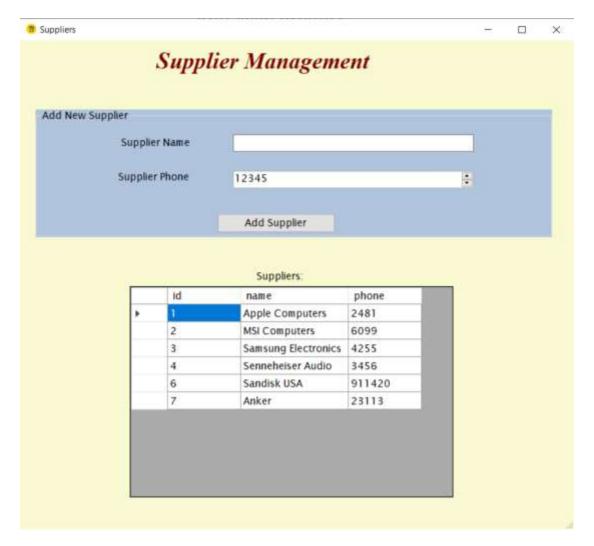
Fig 5.16 Adding new products into inventory
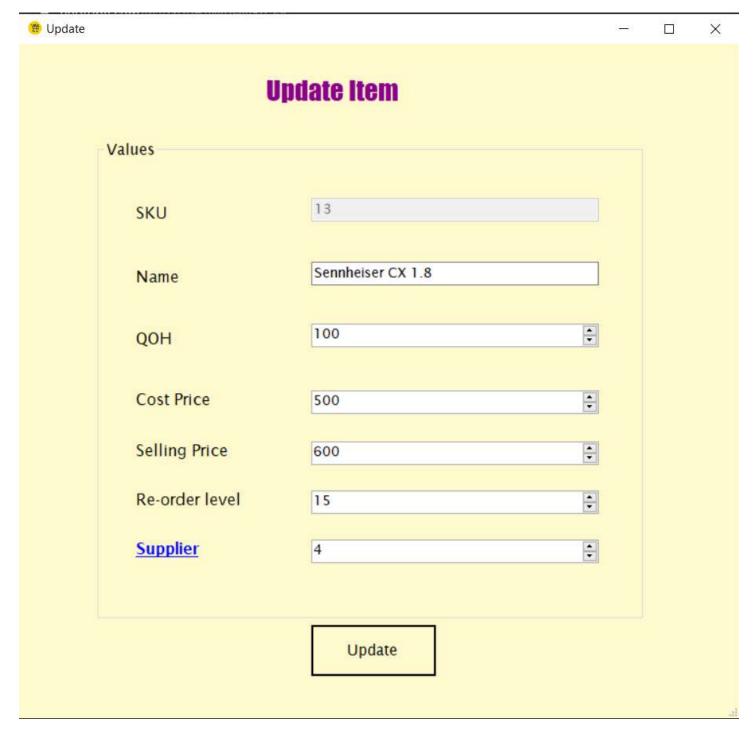
Fig 5.17: Supplier management

Fig 5.18: Updating Inventory Items

6. Conclusion

Hereby, we can conclude that the system has been successfully implemented and the server client connection has been flawlessly implemented by using a cloud centralized database server.

6.1 Future Work:

Implement more types of payments. Implement more types of sales reports with graphs. Receipt Printing Functionality. Automatically contacting suppliers when inventory items go below re-order level attribute. Implement feature for user memberships and tier-based discount systems. Implement Return product functionality.

7. References

1. A Secure Wireless Point of Sale System - Carl J. Debono Department of Communications and Computer Engineering University of Malta Msida, Malta c.debono@ieee.org

2. Security Enhancement Methods for Mobile POS System - Dojun Yang Software R&D Center Samsung Electronics Suwon, South Korea dojun.yang@samsung.com

3. 1 P.G. Scholar, Department of Information & Technology, RTMNU University, Nagpur, Maharashtra 440033, India 2 Tulsiramji Gaikwad Patil College of Engineering Technology, Nagpur, Maharashtra 441108, India

4. Smart Shopping Cart - Akshay Kumar1, Abhinav Gupta1, S Balamurugan1, S Balaji1 and Marimuthu R1* 1School of Electrical Engineering, VIT University, Vellore – IEEE Publication

5. Wireless Point Of Sale Terminal for Credit and Debit Payment Systems - Andrej Zdravkovic Omega Digital Data, Concord, Ontario, Canada