Final Project Report

Current Trends and Projects in Computer Science

Group 4

Prepared by Jamie McCarthy

Svyatoslav Mudryy, Jerome Reed, Ronald Hand, Jamie McCarthy, Arnaud Tako

CMSC 495 7382

Professor Mentzos

13 December 2022

Table of Contents

1 Overview

The Retail Inventory Management Application (RIMA) is a functional, user-friendly, low-maintenance management solution for small stores or retail businesses. It was created using Java for cross-platform interoperability, Netbeans to construct the code and Oracle SQL for the database structure. This application uses a database for inventory and a list of authorized users to assist management with products in stock, orders, sales, reports, customer and vendor information, accounts payable, and accounts receivable. The interface opens with a prompt for the user to log in, at which point the menu appears to navigate through the different options.

2 Project Plan

2.1 Project Scope Management Plan

2.1.1 Project Objectives

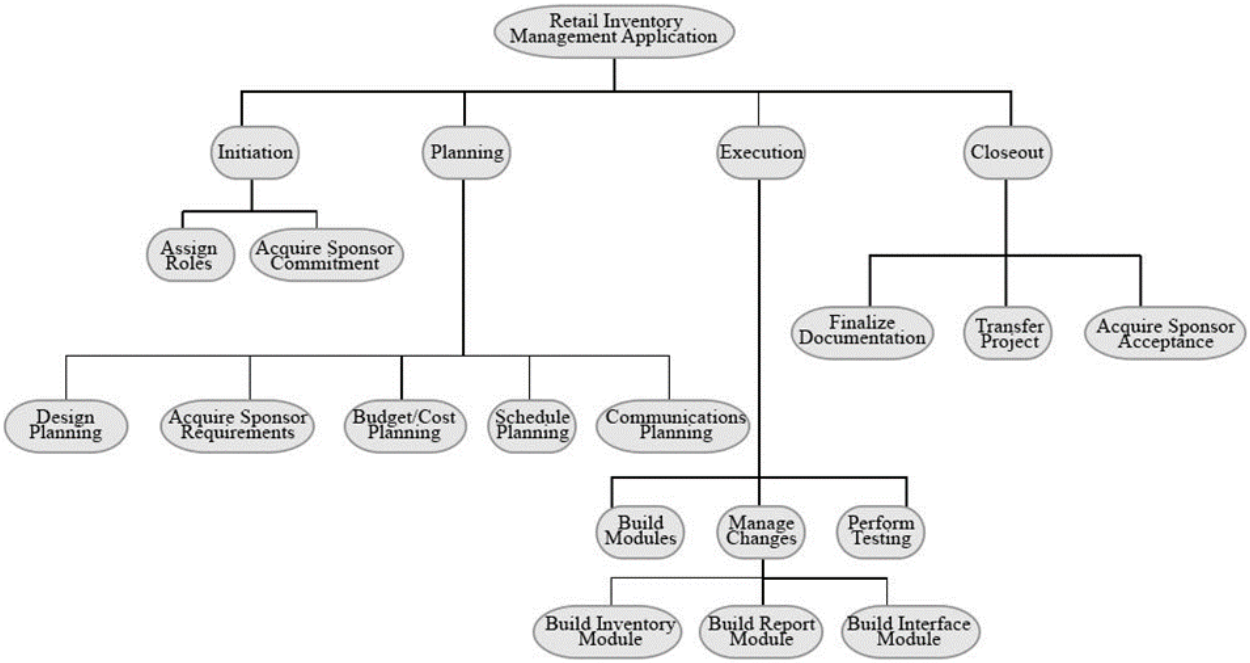
The goal of the Retail Inventory Management Application (RIMA) is to provide a functional, user-friendly, low-maintenance inventory management solution for a small store or retail business. The application will assist management with the following aspects of retail management:

- Product updating
- Storage management
- Inventory control
- Inventory reports

2.1.2 Deliverables

Deliverable Document	Due Date	Deadline Met
Project Plan	01 November	Yes
Test Plan, User Guide	08 November	Yes
Project Design	15 November	Yes
Phase 1 Source	22 November	Yes
Phase 2 Source	29 November	Yes
Phase 3 Source	06 December	Yes
Final Report, Source Code	12 December	Yes

2.1.3 Work Breakdown Structure



2.1.4 Schedule Baseline

2.1.5 Project Milestones

2.1.6 Project Verification and Acceptance

2.1.7 Documenting Changes to Project Scope

2.2 Schedule Management Plan

The Retail Inventory Management Application (RIMA) will take 8 weeks to develop and release. The team will commit to a designed Assignment Schedule (see Appendix D) to assure the development stays on track. The Assignment Schedule is a weekly planner that informs the team of the project elements to be worked on during each week. It specifies the people in charge of leading each phase of development along with the due assignments and their deadlines.

2.3 Cost Management Plan

Due to the fact that everything can be found open source there is no cost associated with this project. So for the client, our gift is free labor!

2.4 Quality Management Plan

Each team member is responsible for Quality Control, as each individual is accountable for the section of work they have been assigned. The Test Director has the responsibility of being a quality control and final reviewer of the product. In addition to the individual quality control reviews and the Test Directors' thorough testing, the code will be written in compliance with the Google JavaScript Style guide.

2.5 Communication Management Plan

Name	Title	Email
Mentzos, Terry	Primary Stakeholder	terry.mentzos@faculty.umuc.edu
Hand, Ronald	Test Director	rhand1@student.umgc.edu
McCarthy, Jamie	Requirements Manager/Technical Writer	jcline014@yahoo.com
Mudryy, Svyatsolav	Project Manager	svyatoslavstudent@gmail.com
Reed, Jerome	Software Designer	jerry@vschool.io
Tako, Arnaud	Software Designer	takoarnaud25@gmail.com

Communication	Medium	Frequency	Goal	Owner
Project Status	WhatsApp	Weekly (Friday)	Review status of project modules and discuss details of deliverables for the week	Project Manager
Deliverable Consolidation	WhatsApp	Weekly (Tuesday)	Discuss consolidation details for deliverables and any issues or delays	All
Task Review	WhatsApp	Weekly	Discuss feedback from deliverables submitted the prior week	Project Manager
Final Product Demonstration	In Person	End of Project	Demonstrate and explain all functionality to project sponsor	Project Manager
Issue Resolution	Call/Text	As Needed	Resolve issues that could delay or prevent on-time deliverable submission	All

2.6 Risk Management Plan

The first step the team will take towards risk management is identifying all possible risks that could take place during planning the procedure and how to avoid any risks that may occur. This requires tracking potential changes to risk factors along the development process, as well as identifying solutions for any risks that may arise. In the event that a risk occurs, the team will

immediately report to the Project Manager, who maintains documentation of all risks and solutions through the development process.

To avoid risk in scope, the client will agree to the terms of development, which will be followed by the development team.

To avoid risk in communication and scheduling, all team members have agreed to dedicate eight weeks of their time to the development of the project and agreed upon a means of communication, as well as a flow of communication, in order to direct any conversation towards the right channel**.**

To avoid quality risk, the development team has established certain requirements, such as frequent and clear communication, observing and following milestones and progress, and constant coordination between all team leads to ensure requirements are met on all ends of the development process.

3 Requirements Specification

3.1 Requirements Management Process

The Requirements Manager is the team member that is responsible for providing all management requirements. Requirements are reviewed by the Requirements Manager then approved by the Project Manager before any changes can be implemented.

3.2 Requirements Type/Artifact Mapping

Artifact	Requirement Type	Description
Project Plan	Stakeholder	Overall plan for the project
Project Design	Developer	Application design, file structure, layout
Test Plan	Developer	Scope, objectives, and methodology of project testing
User Guide	Feature	Application use and guidelines

4 User Guide

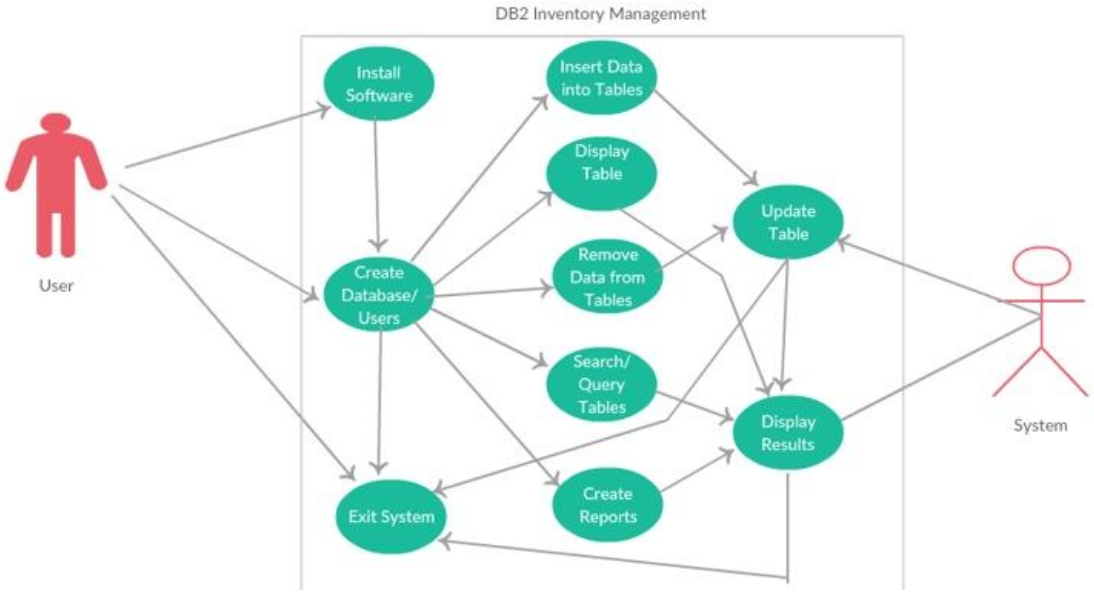
Document Revisions		
Date	Version Number	Document Changes
11/15/2022	1.0	Initial Draft

11/30/2022	1.2	Second Draft
12/13/2022	1.3	Final Draft

4.1 Scope and Purpose

Inventory Management is a generic inventory tracking application that will allow business managers and owners to track items in stock, orders, sales, customer information, and other relevant information. The application has enhanced search/reporting functionality as well as a threshold alerting system.

This guide assumes that user has no prior knowledge of database management and functionality. All features and usage of the application are explained in a detailed format.

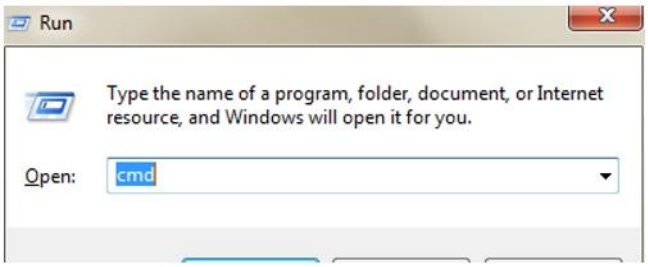


4.2 Install

Install program MySQL:

1. Download software from https://dev.mysql.com/downloads/
2. Unzip the package.
3. Run the setup.exe file.
4. Everything should be installed in *C:\mysql*.
5. Click Windows start icon 
6. Type run in the search bar and hit enter.

7. The window below opens, click OK if cmd is already there if not type cmd and click OK.



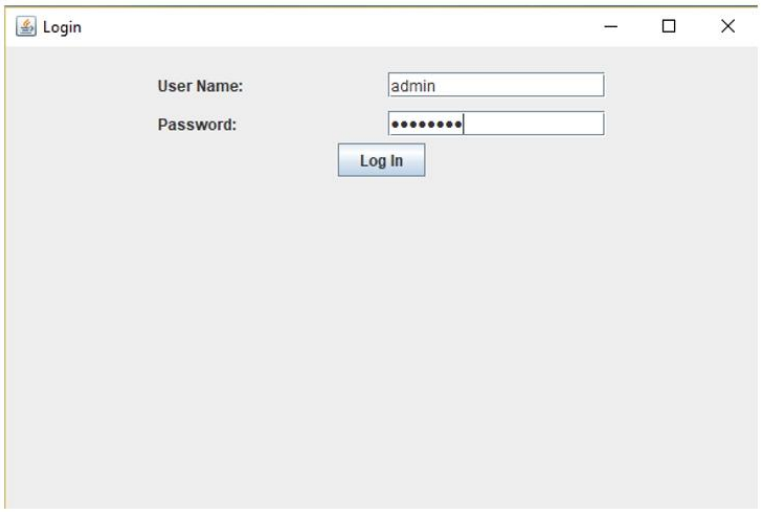
8. Type “cd C:\mysql\bin” then press enter.
9. Type “mysqld.exe” –console then press enter.
10. Startup message should appear. You are connected.

4.3 Log-In

Log-in into the program:

NOTE: Inventory Management comes with a pre-programmed username of “admin” and password “password.”

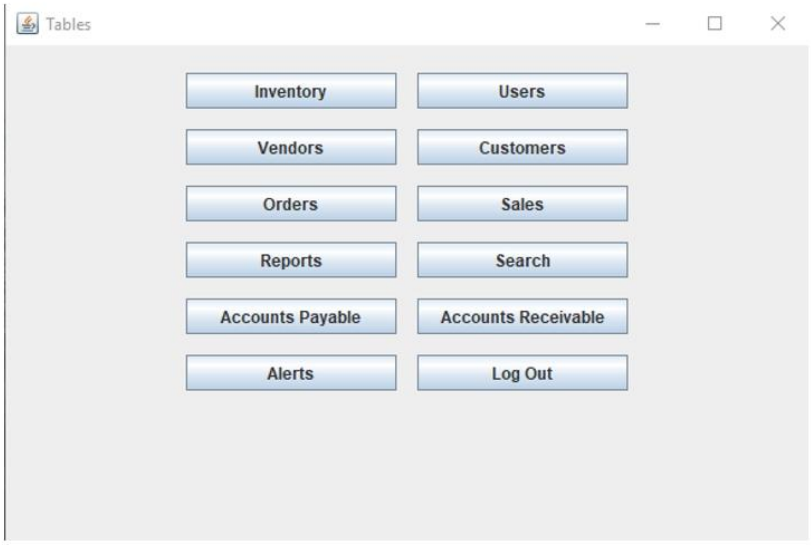
- Log into Inventory Management:



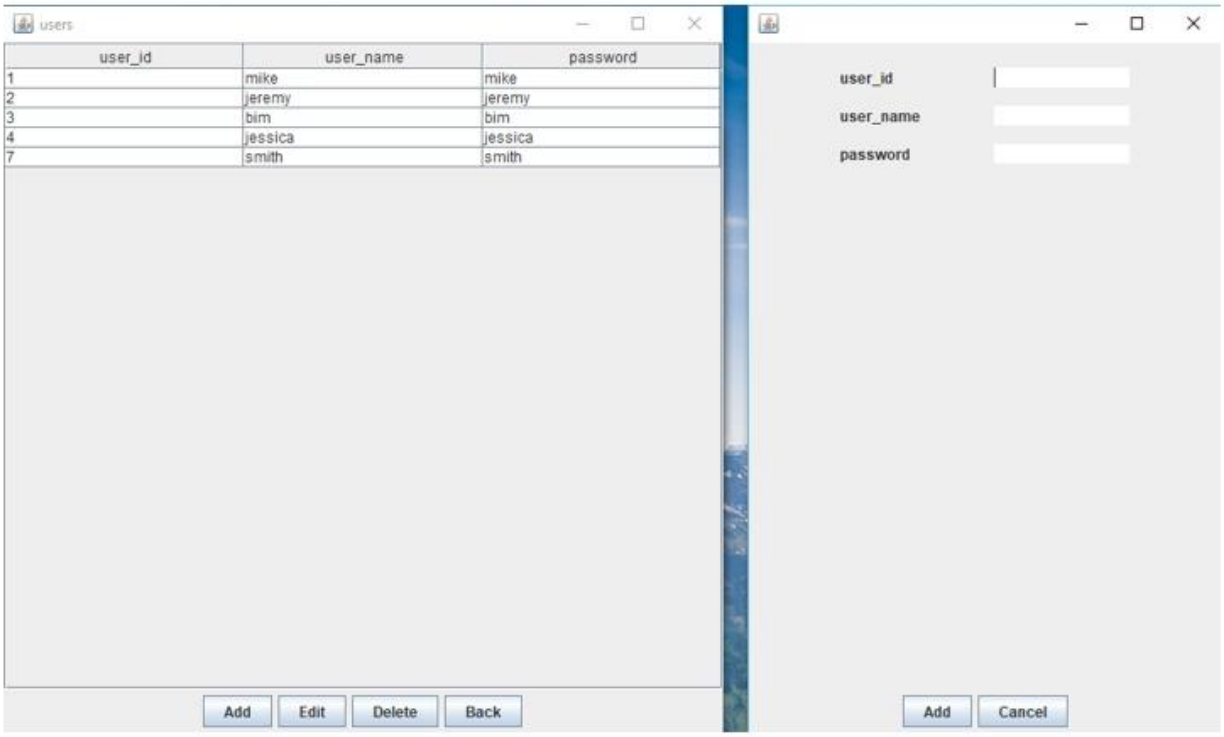
4.4 Create User

Create a new user:

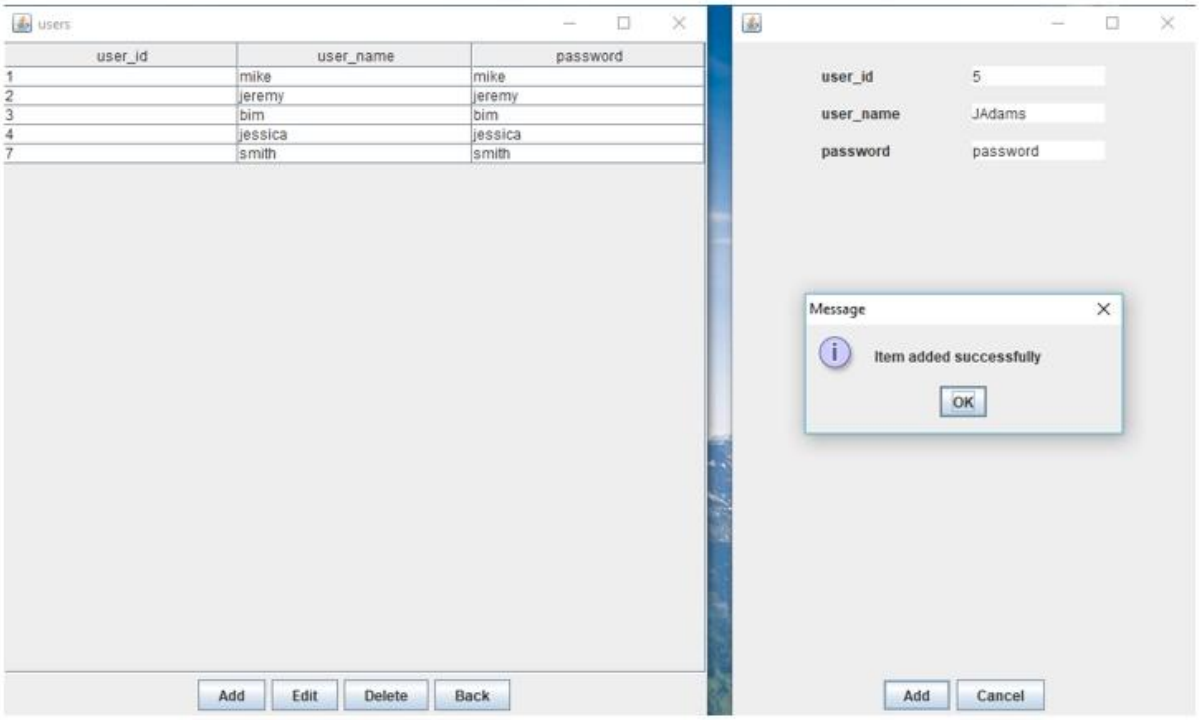
1. Click on Users from the main selection window.
2. Click Add.
3. Enter new username and password.
4. Click Add.
5. Click Cancel to go back to the main selection window.



Main Selection Window 1



Add New User 1

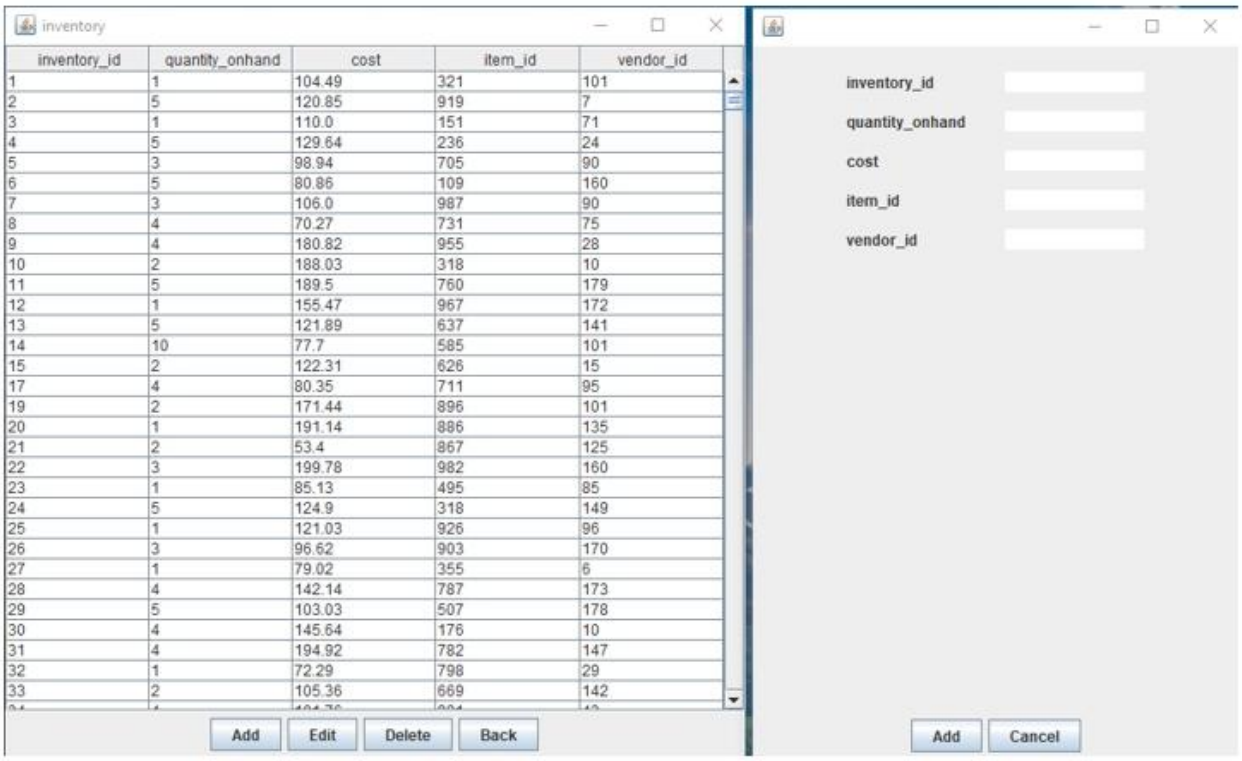


Add New User 2

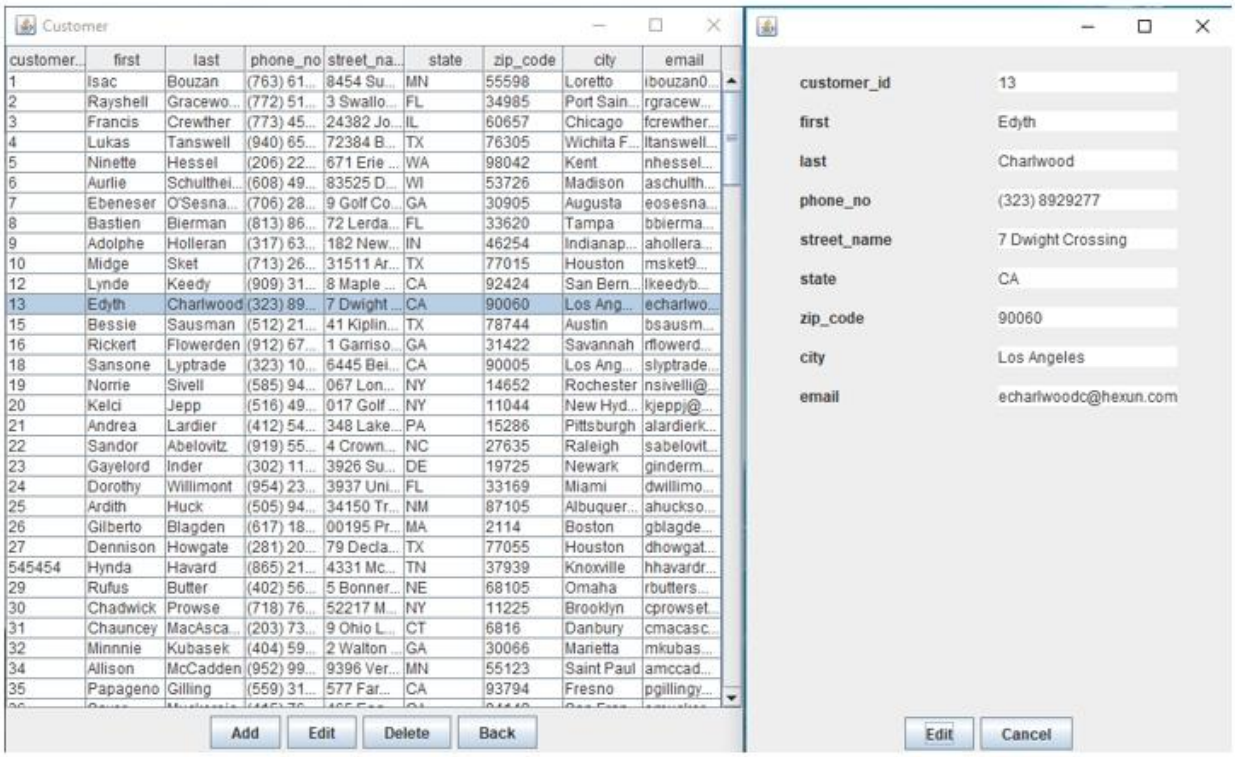
4.5 Add or Edit Data

Add/edit inventory items:

1. Inventory, Users, Vendors, Customers, Orders, and Sales all allow this functionality.
2. Click the desired table from the main selection window.
3. Click Add to add a new item or edit to edit an existing item.
4. Click Add or Edit when done.
5. Click Cancel to go back to the Main selection window.
6. To check that new item was added click on the table again to see new or updated data.



Add Inventory Items 1

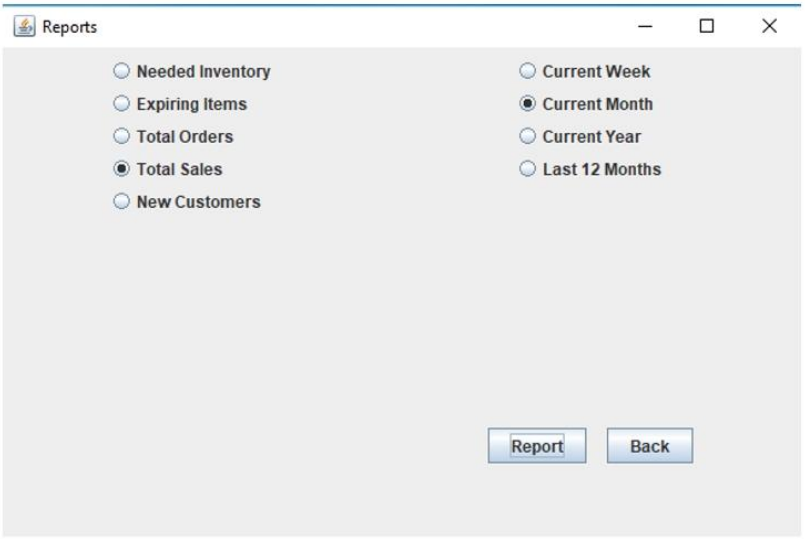


Edit Customer 1

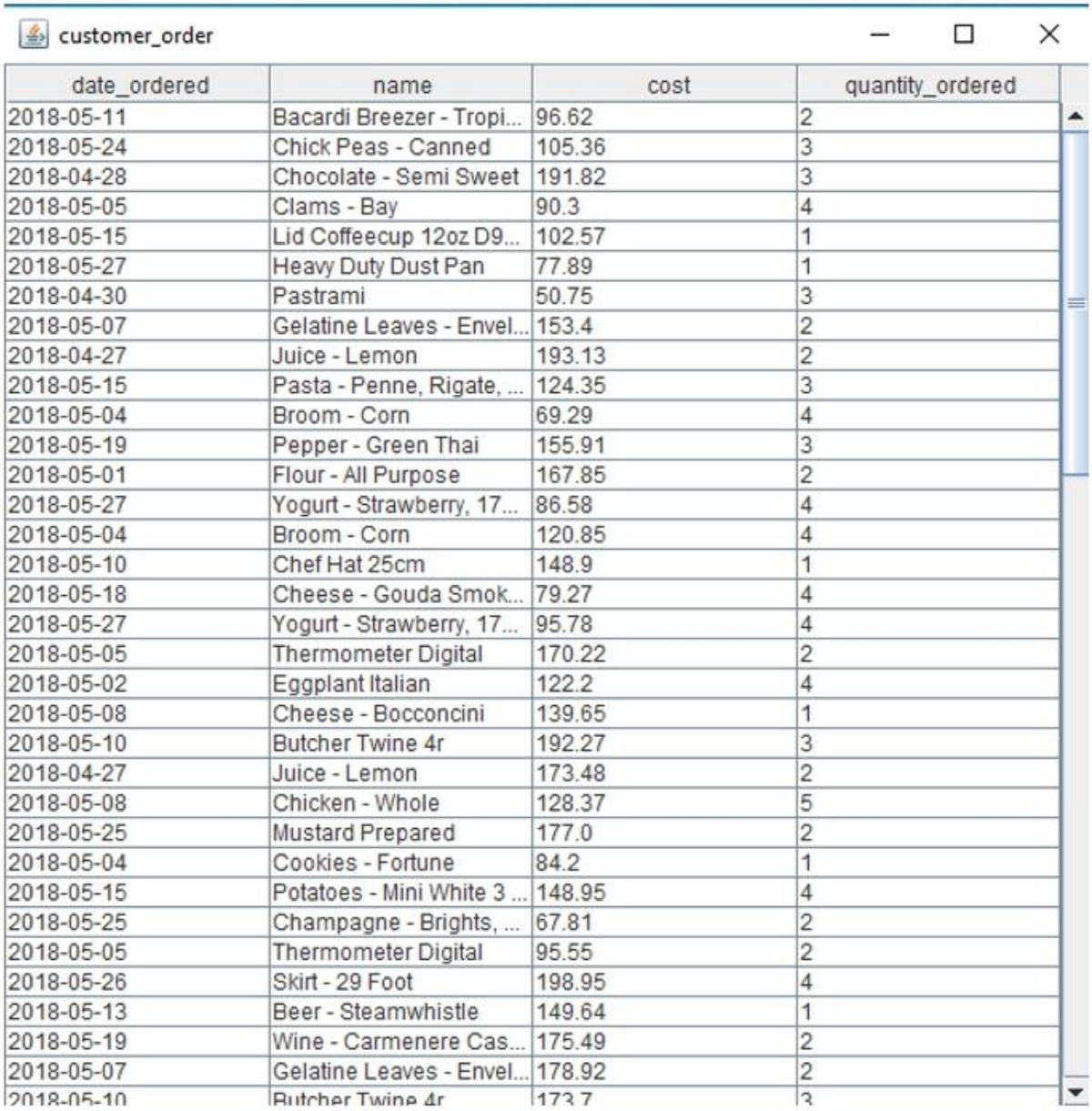
4.6 Reports

Use the reports function:

1. Click Reports from the main selection window.
2. Select which report type.
3. Select window of time.
4. Click Report.
5. Close the window to go back to the Reports window.



Reports 1



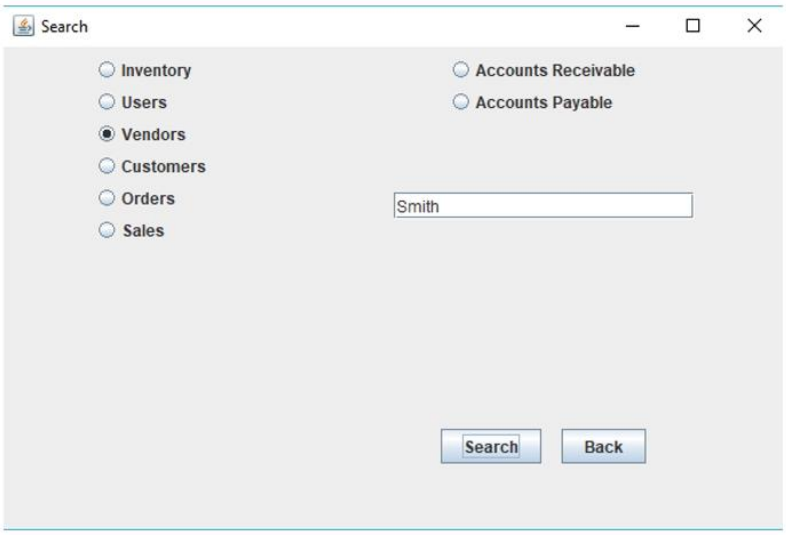
date_ordered	name	cost	quantity_ordered
2018-05-11	Bacardi Breezer - Tropi...	96.62	2
2018-05-24	Chick Peas - Canned	105.36	3
2018-04-28	Chocolate - Semi Sweet	191.82	3
2018-05-05	Clams - Bay	90.3	4
2018-05-15	Lid Coffeecup 12oz D9...	102.57	1
2018-05-27	Heavy Duty Dust Pan	77.89	1
2018-04-30	Pastrami	50.75	3
2018-05-07	Gelatine Leaves - Envel...	153.4	2
2018-04-27	Juice - Lemon	193.13	2
2018-05-15	Pasta - Penne, Rigate, ...	124.35	3
2018-05-04	Broom - Corn	69.29	4
2018-05-19	Pepper - Green Thai	155.91	3
2018-05-01	Flour - All Purpose	167.85	2
2018-05-27	Yogurt - Strawberry, 17...	86.58	4
2018-05-04	Broom - Corn	120.85	4
2018-05-10	Chef Hat 25cm	148.9	1
2018-05-18	Cheese - Gouda Smok...	79.27	4
2018-05-27	Yogurt - Strawberry, 17...	95.78	4
2018-05-05	Thermometer Digital	170.22	2
2018-05-02	Eggplant Italian	122.2	4
2018-05-08	Cheese - Bocconcini	139.65	1
2018-05-10	Butcher Twine 4r	192.27	3
2018-04-27	Juice - Lemon	173.48	2
2018-05-08	Chicken - Whole	128.37	5
2018-05-25	Mustard Prepared	177.0	2
2018-05-04	Cookies - Fortune	84.2	1
2018-05-15	Potatoes - Mini White 3 ...	148.95	4
2018-05-25	Champagne - Brights, ...	67.81	2
2018-05-05	Thermometer Digital	95.55	2
2018-05-26	Skirt - 29 Foot	198.95	4
2018-05-13	Beer - Steamwhistle	149.64	1
2018-05-19	Wine - Carmenere Cas...	175.49	2
2018-05-07	Gelatine Leaves - Envel...	178.92	2
2018-05-10	Butcher Twine 4r	173.7	3

Customer Order Report 1

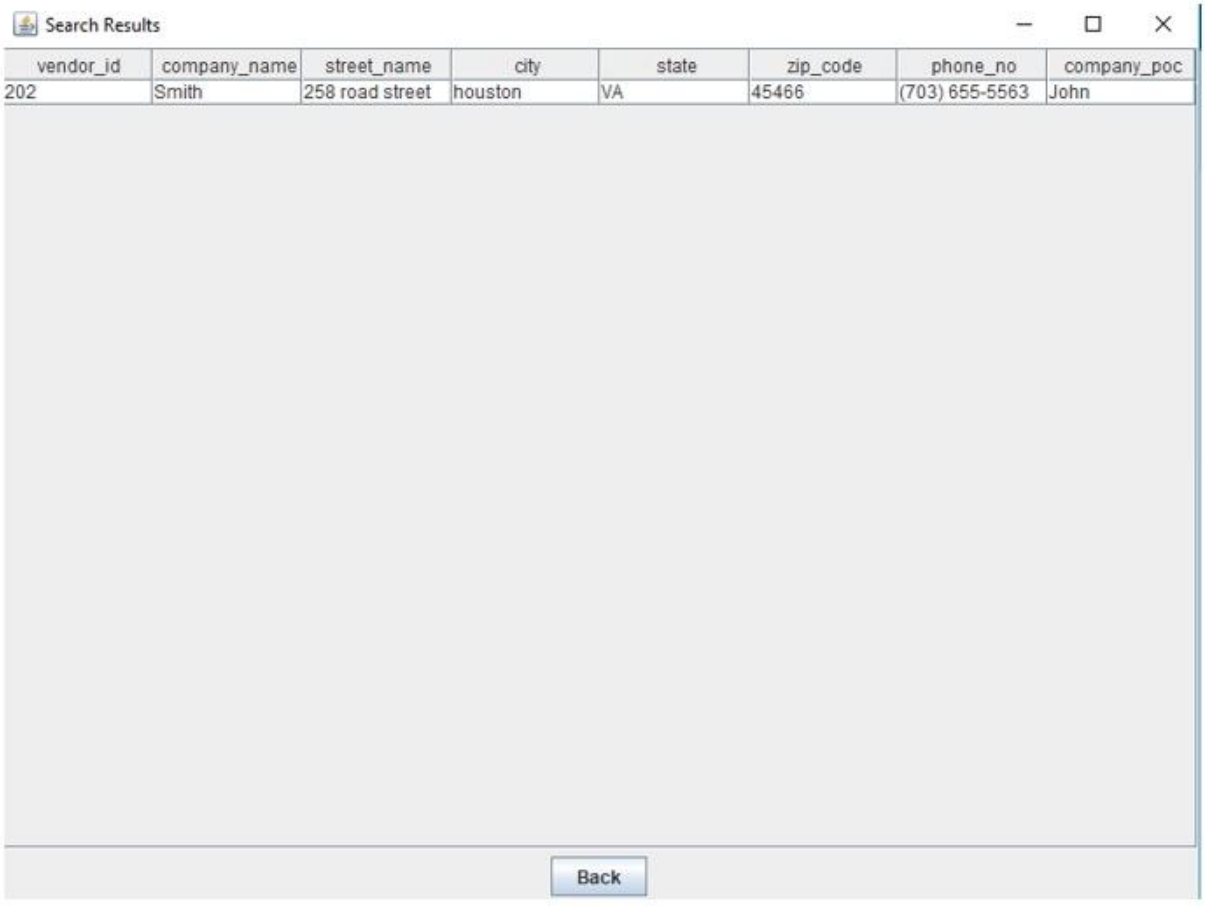
4.7 Search

Use the search function:

1. Click Search from Main Selection Window.
2. Select table you want to search in.
3. Type in a search word.
4. Click Search.
5. Click Back to go back to the Search Window.
6. The search function will search all columns of data within the selected table.



Search Window 1

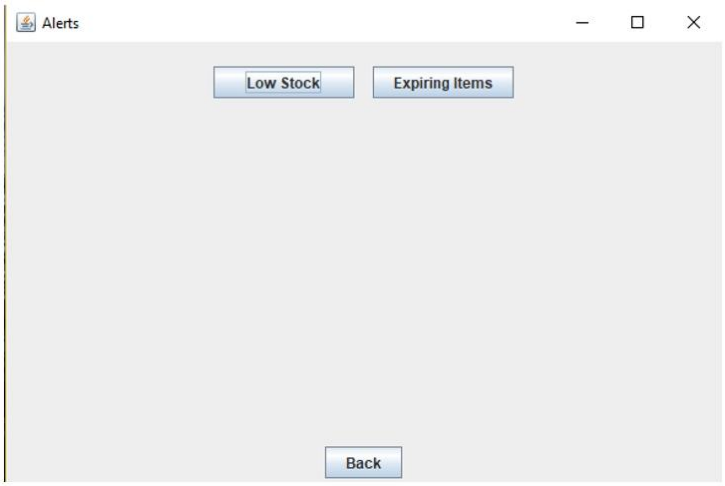


Search Results 1

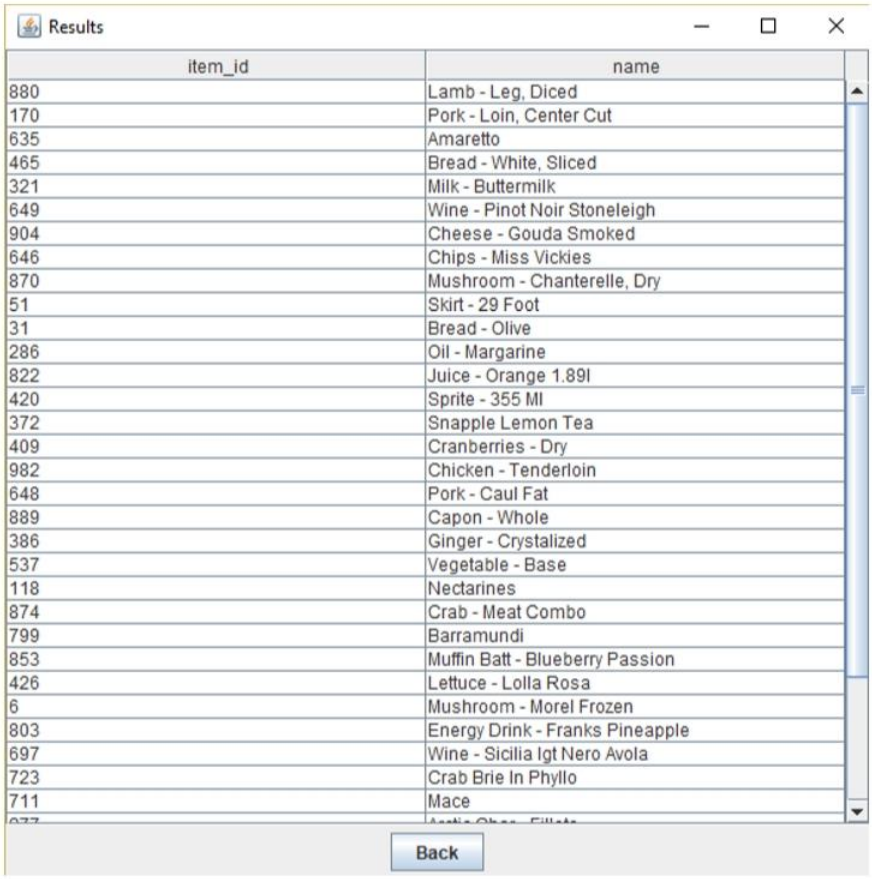
4.8 Alert

Use the alert function:

1. Click Alerts from the main selection window.
2. Click Low Stock Button to see items that have a quantity of less than 3.
3. Click Expiring Items to see items that will expire within the next seven days.
4. Click Back to go back to the main selection window.



Alerts Window 1



4.9 Standard Tables

The following tables come standard with the Inventory Management Application:

Table	Description
Items	Stores information about things available in inventory such as quantity and vendor.
SalesDetails	Stores actual items per sale.
Sales	Stores necessary information about sales to customers.
OrdersDetails	Stores actual items ordered per order.
Orders	Stores necessary information about orders made from vendors such as items ordered, date, and quantity.
Customers	Stores information about customers such as contact information.

Vendors	Stores information on vendors such as name, poc, and contact info.
Invoices	Stores information about invoice details such as invoice number, order number, and date.
Payments	Stores payment information to vendors (invoice number, vendor id, bill total, bill balance.

5 Test Plan and Results

5.1 Introduction

The goal of the Retail Inventory Management Application (RIMA) is to provide a functional, user-friendly, low-maintenance management solution for a small store or retail business. The application will assist management with product updates, storage, inventory control, and report production. There will be multiple features of this product that will require component testing to verify product operability and functionality. The interoperability of system components are to be tested throughout the development lifecycle utilizing both automated and manual testing procedures.

5.2 Objective

The objective of this test plan is to determine what testing strategies would be most applicable to be utilized throughout the software development cycle of the RIMA.

5.3 Scope

5.3.1 Items to be Tested

Item to Test	Test Description	Test Date	Responsibility
GUI	Test GUI for operation/functionality	11/16/22	Ronald Hand
Login/Logout	Junit test login/logout function	11/16/22	Ronald Hand
Logging	Test proper logging procedure 1	11/16/22	Ronald Hand
Database function	Test Database	11/16/22	Ronald Hand

5.3.2 Items to not Test

Item to not Test	Test Description	Test Date	Responsibility

N/A at this time			

5.4 References

All testing is to be derived from Open Web Application Security Project(OWASP) Testing Guide 4.0.

5.5 Testing Overview

5.5.1 Test Process

Testing should occur at all phases of the software development cycle to test for correct functionality, as well as testing for possible security related issues that may occur. The testing director will maintain constant feedback cycles with developers and the project manager. The testing process allows the detection of errors in the application. It is the primary quality measure applied during the software's development. During testing, the system application is executed with specific test cases, and the software's output is assessed to establish if it is performing as to its expectations. In this inventory management software, unit testing will be applied on single modules as they are completed and become implemented. The modules will be tested using the following strategies:

Black Box Testing
This strategy will allow the test cases to be created as input conditions that fully implement all the functional requirements of the system program. This testing will detect errors in the following groups

- Missing or incorrect functions.
- Interface errors.
- Permanent errors.
- Errors in external database access or data structure.
- Initialization and termination errors.

The method of testing will allow only the input to be checked for accuracy if the logical flow of data is not checked.

White Box Testing
The test cases will be created based on the logic of each module by drawing flow graphs of the module and logical decisions that are tested on all the cases. This strategy is used to generate test cases in the following cases:

- Execute internal data structure to guarantee their validity
- Execute all loops at their boundaries within their operational bounds
- Ensure that all independent paths have been executed
- Execute all logical decisions on their false and true sides.

Supporting documents
The support documents consist of user documentation and technical documentation whereby the system personnel will maintain the application throughout its productive life(technical) and the people that will be using the systems as part of their daily lives

(users). The user document will involve training by applying particular, general for the off-the-shelf software and the operating system. User documentation will also involve educational materials and problem solving assistance to the information system.

5.5.2 Data Creation for Testing

Data creation for testing will be conducted using test functions through the NetBeans IDE test function as well as possible outside toolkits to test for program functionality and security protocols as appropriate.

5.5.3 Bug Life Cycle

System bugs and vulnerabilities will be tracked using a Google document located in the team 4 Google drive area. Bugs assigned to the tracker will be corrected in a timely manner by an assigned team member and corrected according to bug severity with major issues being corrected immediately.

5.6 Test Strategy

5.6.1 Testing Types

Manual testing of various features within the program to ensure complete operability and intuitiveness. Automatic testing of appropriate units to increase efficiency of testing during development phases.

5.6.2 Tools

Tool Name	Vendor	Version Date	Version
NetBeans	Apache	08/31/22	15
Junit	Open Source	N/A	5
AWS	Amazon	N/A	N/A

5.6.3 Units Tested

- GUI testing will be conducted using both automatic and manual methods to ensure unit operability.
- Login/logout operability will mostly be tested using automatic methods, but manual testing also occurs during the troubleshooting of other components.
- Logging tests will mostly be manual, but automatic testing may be applied if appropriate.
- Database function testing will be primarily manual, but automatic testing may be applied if appropriate.

5.7 Test Environment

Environment	Version

Java Development Kit	8.x
DynamoDB	2019.11.21

5.8 Test Schedule

5.8.1 Test Planning

Testing requirements determined at this phase.

Activity	Start	End	Responsible
Prepare Test Plan	7th Nov 2022	8th Nov 2022	Ronald Hand
Review Test plan	8th Nov 2022	8th Nov 2022	Svyatoslav Mudryy
Prepare Test scripts, Checklists	9th Nov 2022	15th Nov 2022	Jerome Reed Arnaud Tako
Review Test Scripts	15th Nov 2022	15th Nov 2022	Jamie McCarthy
Prepare Test Environment	16th Nov 2022	18th Nov 2022	Jerome Reed
System Testing	19th Nov 2022	23rd Nov 2022	Ronald Hand
General Functionality Testing	24th Nov 2022	1st Dec 2022	Arnaud Tako
Performance Testing	5th Dec 2022	10th Dec 2022	Svyatoslav Mudryy

5.8.2 Design Phase

Team collaboration activities aimed at determining project type. This phase will compromise the development of the team's project plan, test plan, and initial user guide. The team will also determine project requirements such as systems requirements and tool utilization.

5.8.3 Code Complete

Testing will be performed throughout the code development process. Complete system testing will be performed at this stage, and all issues found are logged and assigned for correction or documented if appropriate.

5.8.4 Feature Complete

Any unresolved issues will be logged and documented for correction at further program

version itineration.

5.8.5 Regression Test

A final systems regression test will be executed to ensure system operability and performance after final coding changes have occurred. Any major issues detected will be immediately corrected, and regression testing will occur again.

5.9 Control Procedure

5.9.1 Reviews

Reviews will be conducted as appropriate for coding or requirement changes that may impact unit testing.

5.9.2 Bug Review

Bug reviews will be conducted as appropriate. A bug review will be conducted after major code, design, and requirements changes.

5.9.3 Changes

Changes will be approved by team majority consensus, and final approval determined by the project manager. Test cases will be changed as appropriate after preliminary changes have been implemented.

5.9.4 Defects

Defects found will be logged in the team 4 bug tracker document located in the team 4 Google drive.

.

5.10 Roles

Role	Name	Responsibility
Project Manager(PM)	Svyatoslav Mudryy	Overall project oversight
Requirement Manager/Technical Writer(RM/TE)	Jamie McCarthy	Develops project system requirements, and software documentation
Software Designer(SW)	Jerome Reed	Develops coding necessary for project requirements
Software Designer(SW)	Tako Arnaud	Develops coding necessary for project requirements
Test Director(TD)	Ronald Hand	Develops unit and overall testing of software

5.11 Deliverables

Deliverable	Responsibility
Test Plan	Overview of test plans during design phase
Unit Test Reports	Final unit testing results and regression testing

5.12 Entry Criteria

Unit and system tests have been completed and determined to be of satisfactory quality. Likewise, unit and system test cases should be completely documented for the team's final report. Regression testing should also be documented for final reporting procedural purposes.

5.13 Suspension Criteria

Significant issues surrounding the operability/usability of the RIMA will cause a standdown of testing until such a time those issues are corrected.

5.14 Resumption Criteria

Once detected significant issues/defects/bugs are corrected, and then testing will be resumed at the discretion of the project manager and test director.

5.15 Exit Criteria

No significant issues were detected that might affect system operability. All test cases have been executed without major fault, and minor issues have been properly logged and documented.

5.16 Risks

Major issues or changes requiring a delay in development may also delay or degrade system/unit test functions, causing missed project milestones and concatenating possible systematic failures.

6 Design and Alternate Designs

6.1 Software Design Component

6.1.1 Customer

A retail store is where customers buy goods for their own use. The customers will be able to buy items singly or in small packs. This contrasts with a wholesale store, which is where retailers buy goods in large quantities, not to use, but to re-sell individually to their customers.

6.1.2 Branch

A branch store is one which is located away from the main store. For example, if a store in one town finds they have a lot of potential customers in another town, they might open up a branch store there. Some stores have branches all over the country, and instead of the main store, they have a central warehouse or depot.

6.1.3 Inventory Management System

An inventory management system is a combination of hardware and software technology, which tracks and manages product inventory, product sales, and other production processes.

6.1.4 Server

A server of stores sends and receives data. In essence, it "serves" something else and exists to provide services. A computer, software program, or even a storage device may act as a server, and it may provide one service or several.

6.1.5 Database

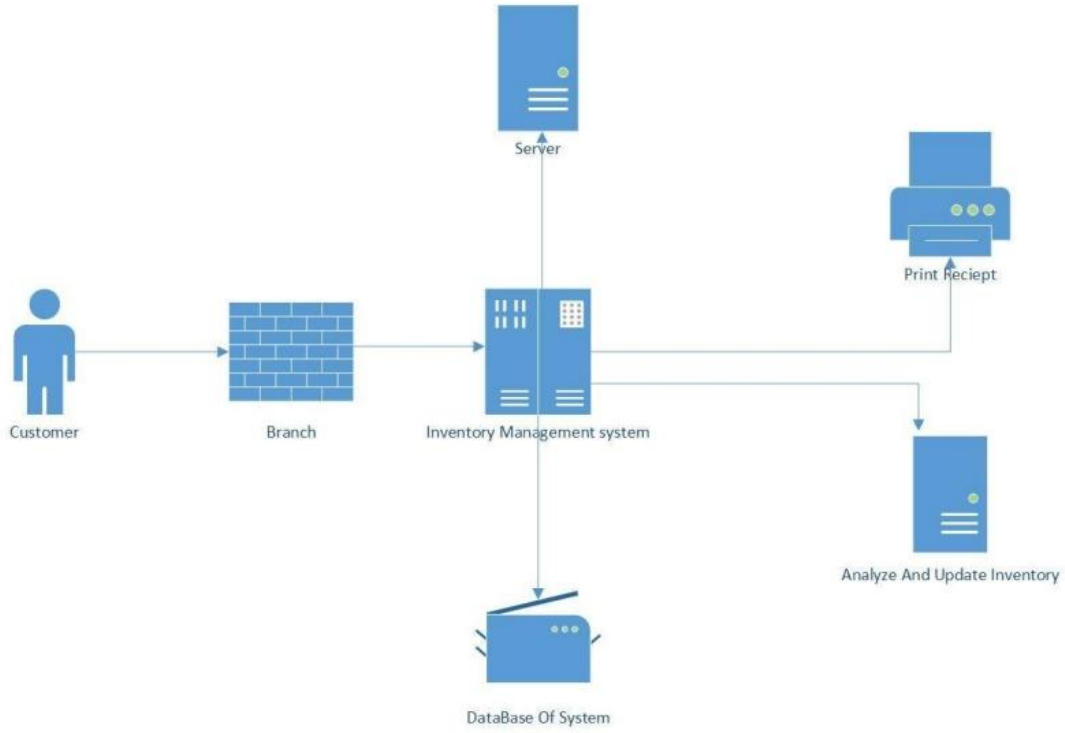
The database of the store is used to store the data of inventory.

6.1.6 Print Receipt

When the customer completes their shopping, the receipt will be printed by the admin.

6.1.7 Analyze and Update Inventory

The admin analyzes the information and updates the inventory.



6.2 RIMA Retail Inventory Management System

6.2.1 Mockup 1

6.2.2 GUI Mockup 1

The GUI takes input from the admin and stores the information of the items, and adds new items to the inventory.

The GUI mockup one contains three fields through which the admin can manage their inventory.

Warehouse ID - the admin enters the id of the warehouses where he stores the products or items.

Warehouse Name - the admin enters the warehouse's names assigned to the product.

The next field is for checking the detail of the products:

Item ID - in item id the admin enters the number assigned to the product.

Items Name - in the item Name, the admin enters the product name.

Price - shows the prices of items.

Stock - shows the remaining quantity of product stored in the warehouse.

Category - shows the category of the Item which is assigned by the admin for products.

6.2.3 Buttons

Save - works when the admin can make changes or add any new item in inventory.

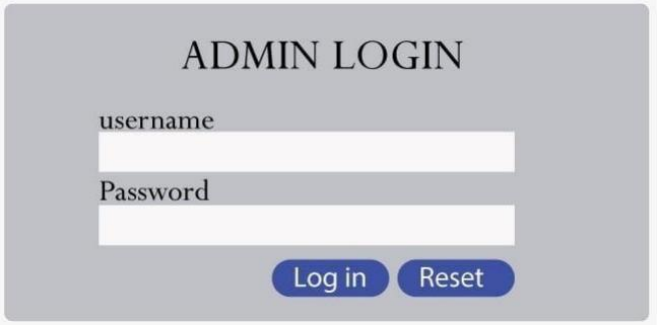
Update - works when the admin updates the inventory of the store.

Cancel - used to cancel changes.

6.3 Admin Login

On the login page of the system admin can access the system by providing their username and password. When the username and password is incorrect, the admin cannot access the system.

If an admin doesn't remember their password, it can also reset their password by pressing the reset button, and when the admin presses the reset button, it provides the answers to the security question provided by the admin the first time to reset their password.



Username - take input from the admin and check the username is authenticated.

Password - take the input from the admin to check the person is authorized.

6.3.1 Buttons

"Log in" login button can allow the admin to access the system when the admin clicks on the login button, it takes it to the system dashboard where it can manage the inventory.

The "Reset" reset button works when the password is wrong so the admin can reset their password and create a new password and then access the system successfully.

6.4 Receipt

The Receipt for the customer contains information about products he buys from the store when the customer buys some item from the store, the system puts the information in the receipt, which includes:

Item ID - the number assigned by the system for the product.

Item Names - the name of items the customer buys from the store.

Quantity - shows the number of items the customer bought from the store.

Price - shows the price for each product the customer buys from the store.

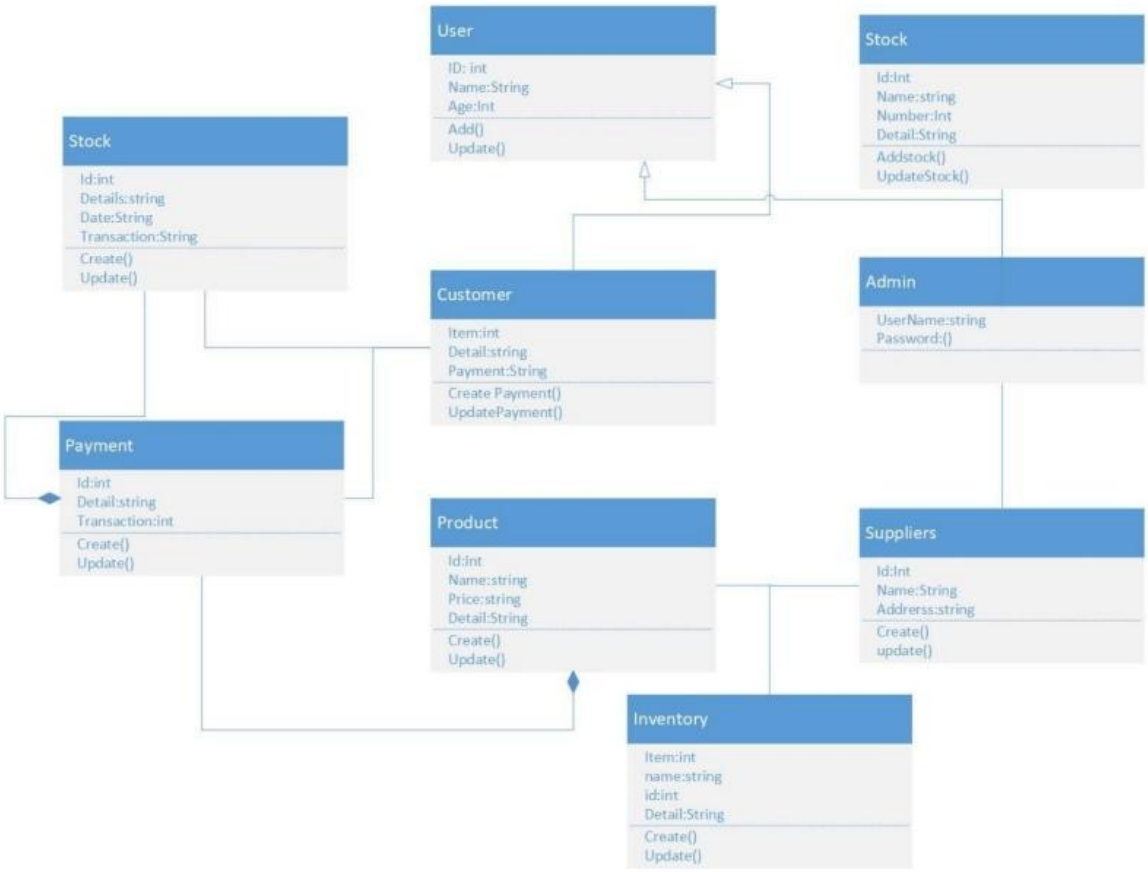
Total Price - shows the prices of all the product customer buy from the store.

6.4.1 Buttons

"Print" button can print the receipt when the admin prints the receipt for the customer.

6.5 Database Diagram for the RIMA System

The database store all the records of the store, which include stock products payment suppliers, etc. history of the products , information of items stock and the Payments information



7 Development History

7.1 Phase 1 Source

Phase 1 included design, test plan, and the platform that the application will be operating on. The Testing Director performed a test run with current functionality.

7.2 Phase 2 Source

Phase 2 created updates to the application with further menu options, the login function, and the database for inventory and authorized users. The test run during this phase included the functionality of the additional menu options like the addition or deletion of inventory, customers, orders, and report creation.

7.3 Phase 3 Source

The design was completed, and final test runs were completed.

7.4 Final Phase

All source code and all deliverables are submitted.

8 Conclusions

Group 4 has worked through several significant roadblocks in the development of Inventory management system. The group had worked together in every software development cycle including project plan, test plan, project design, development and testing. The development part was split into three phases. The overall goal of the Group 4 project was a success, and every member was instrumental in finalizing the product. The code is working effectively and as expected.

Lessons learned

1. Limiting scope early on would have helped keep the project on track throughout the development.
2. Team communication needed to be more frequent.
3. Working together as a cohesive team made for a better product.
4. Learning every aspect of the Software Development Life Cycle (SDLC).

Reference

IEEE Standard for Software and System Test Documentation

Eriksson, U. (2018, March 14). How to write a good test plan according to IEEE 829 standard. Retrieved Dec 07, 2022, from https://reqtest.com/testing-blog/how-to-write-a-test-plan-2/

Tutorials Point. “SDLC Overview.” Www.tutorialspoint.com, Tutorials Point, 07 Dec, 2022, www.tutorialspoint.com/sdlc/sdlc_overview.htm.