Food Waste Reduction Platform

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Contents

[Version History 3](#_Toc162026879)

[Introduction 3](#_Toc162026880)

[**Target Audience** 3](#_Toc162026881)

[Application Architecture 4](#_Toc162026882)

[1. User Interface Layer: 4](#_Toc162026883)

[2. Application Layer: 4](#_Toc162026884)

[3. Business Logic Layer: 4](#_Toc162026885)

[4. Data Layer: 4](#_Toc162026886)

[5. Security Layer: 4](#_Toc162026887)

[Business Architecture 5](#_Toc162026888)

[User Login and Registration: 5](#_Toc162026889)

[Retailer Use Cases: 6](#_Toc162026890)

[3. Charitable Organization Use Cases: 7](#_Toc162026891)

[4. Consumer Use Cases: 8](#_Toc162026892)

[5. Surplus Food Alert Use Cases: 9](#_Toc162026893)

[Detailed Design 11](#_Toc162026894)

[Data Architecture 13](#_Toc162026895)

[Tables 13](#_Toc162026896)

[Views 13](#_Toc162026897)

[Security Architecture 15](#_Toc162026898)

[Deployment Architecture 15](#_Toc162026899)

[1.Server Setup: 15](#_Toc162026900)

[2.App Deployment: 15](#_Toc162026901)

[3.Database Configuration: 15](#_Toc162026902)

[4.Accessibility Configuration: 15](#_Toc162026903)

[5.Scaling Strategy: 15](#_Toc162026904)

[Testing Model 16](#_Toc162026905)

[1.Manual Testing: 16](#_Toc162026906)

[2. Unit Testing: 16](#_Toc162026907)

[3. Integration Testing: 16](#_Toc162026908)

[4. API Testing: 16](#_Toc162026909)

[5. User Testing: 16](#_Toc162026910)

[6. Load Testing: 16](#_Toc162026911)

[Bonus Functionality: 17](#_Toc162026912)

# Version History

Version #: 1.0

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# Introduction

Welcome to the Food Waste Reduction Platform, an innovative solution designed to combat the global issue of food waste. This document serves as a guide to the conceptualization and implementation of this platform, which aims to connect food retailers, consumers, and charitable organizations in a collaborative effort to reduce waste and promote sustainability.

Food waste is a pressing concern with profound environmental, social, and economic implications. By facilitating the efficient redistribution of surplus food, our platform strives to minimize waste, alleviate hunger, and foster resilient food ecosystems.

In this document, we will explore the functional requirements, architectural design, and implementation details of the Food Waste Reduction Platform, highlighting its potential impact on addressing one of the most significant challenges of our time.

# **Target Audience**

Target Audience will be developers, engineers, project managers, business analysts, stakeholders and end users.

# Application Architecture

The Food Waste Reduction Platform is designed to facilitate the efficient redistribution of surplus food among food retailers, consumers, and charitable organizations. The architecture of the system comprises several main components, each serving specific functions to ensure seamless interaction and operation. Here's a high-level overview:

## 1. User Interface Layer:

This layer encompasses the user-facing components of the platform, including web and mobile interfaces for registration, login, inventory management, browsing surplus food items, and subscribing to surplus food alerts. Users interact with the platform through intuitive interfaces tailored to their specific roles (retailers, consumers, or charitable organizations).

## 2. Application Layer:

The application layer contains the core logic and functionality of the Food Waste Reduction Platform. It includes modules for user registration, authentication, inventory management, surplus food identification, listing surplus food items, claiming food items by charitable organizations, purchasing items by consumers, and managing subscriptions for surplus food alerts.

## 3. Business Logic Layer:

This layer houses the business rules and processes governing the operation of the platform. It encompasses algorithms and decision-making logic related to inventory management, surplus food identification, matching surplus food items with consumers or charitable organizations based on preferences and location, and sending automatic notifications for surplus food alerts.

## 4. Data Layer:

The data layer stores and manages all the information processed by the platform. It consists of a relational database or a NoSQL datastore to store user profiles, inventory data, transaction records, subscription details, and other relevant information. The data layer ensures data integrity, security, and scalability of the platform.

# Business Architecture

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## User Login and Registration:

A diagram of a network

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All users can register and create their own account by clicking the “Register” button, then enter username , name, email, user type and password, press “Create” to submit. Admin will check if the username exists.

All users can login with their own account by entering username and password, then press “login” button to login. Admin will check if the username and password are matched in the database.

## Retailer Use Cases:

**Use Case 1: Inventory Management**

Description: Retailers can add, update, and manage their inventory of food items, including setting expiration dates and quantities. Retailer can add item by clicking “Add” button, update by clicking “Edit” button, and delete by clicking "delete” button.

A diagram of a diagram

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Actors: Retailer

Preconditions: Retailer logged into the platform.

Flow of Events: Retailer accesses the inventory management feature, adds or updates food items, specifies expiration dates and quantities.

Postconditions: Inventory updated with new or modified items.

**Use Case 2: Surplus Food Identification**

Description: Retailers can identify surplus food items nearing expiration or in excess of demand.

Retailer can identify food items by clicking on “discount” button or ”surplus” button.

A diagram of a function

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Actors: Retailer

Preconditions: Retailer logged into the platform.

Flow of Events: Retailer reviews inventory, identifies surplus items based on expiration dates and demand.

Postconditions: Surplus items flagged for donation or sale.

## 3. Charitable Organization Use Cases:

**Use Case 3: Claim Food**

Description: Charitable organizations can claim surplus food items listed by retailers for donation.

Charitable organizations can claim surplus food items by clicking on “Claim” button.

Charitable organizations can view all the surplus food items by clicking view Surplus food.

A diagram of food and text

Description automatically generated

Actors: Charitable Organization

Preconditions: Charitable organization logged into the platform.

Flow of Events: Charitable organization browses surplus food listings, selects items for donation, and claims them.

Postconditions: Claimed food items removed from retailer inventory.

**Use Case 4: Update Inventory**

Description: Retailer inventory is updated when a charitable organization claims surplus food items.

Actors: Charitable Organization, Retailer

Preconditions: Charitable organization claims food items.

Flow of Events: Platform updates retailer inventory to reflect claimed items.

Postconditions: Retailer inventory adjusted accordingly.

## 4. Consumer Use Cases:

**Use Case 5: Purchase**

Description: Consumers can purchase surplus food items listed by retailers at discounted rates.

Consumers can purchase Food with discounted by clicking on “Purchase” button.

Consumers can view all the discounted food list by clicking on “Discount Food list” button.

A diagram with text and images

Description automatically generated with medium confidence

Actors: Consumer

Preconditions: Consumer logged into the platform.

Flow of Events: Consumer browses surplus food listings, selects items for purchase, and completes the transaction (not real).

Postconditions: Purchased items reflected in consumer's order history.

**Use Case 6: Update Inventory**

Description: Retailer inventory is updated when a consumer purchases surplus food items.

Actors: Consumer, Retailer

Preconditions: Consumer completes purchase.

Flow of Events: Platform updates retailer inventory to reflect purchased items.

Postconditions: Retailer inventory adjusted accordingly.

## 5. Surplus Food Alert Use Cases:

**Use Case 7: User Subscription**

Description: Users can subscribe to receive surplus food alerts based on location, communication method, and food preferences.

User can subscribe to receive surplus food alerts by clicking on “subscribe” button.

User can view the subscribe item list.

A diagram of food and subscribe

Description automatically generated

Actors: User

Preconditions: User logged into the platform.

Flow of Events: User accesses subscription settings, specifies location, communication method, and food preferences.

Postconditions: Subscription activated for surplus food alerts.

**Use Case 8: Automatic Notifications**

Description: Users subscribed to surplus food alerts receive automatic notifications when retailers list surplus food items.

Actors: Administrators

Preconditions: Retailer lists surplus food items.

Flow of Events: Admin sends notifications to subscribed users based on location and preferences.

Postconditions: Users receive notifications about available surplus food items.

# Detailed Design

**A diagram of a food system

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**A diagram of a business process

Description automatically generated**

**A screenshot of a computer screen

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# Data Architecture

## Tables

User

This entity represents the users of the Food Waste Reduction Platform. Each user will have attributes such as name, password, location, contact information and user type. User(retailers) is related to Product.

Product

This entity represents the food items which is provided by User(retailers). Each product will have attributes such as name, normal price, inventory, expiry date, product type, discount rate, date of listing surplus items and rating. Product is related to User(retailers).

User Subscription

This entity represents the User Subscription information. Each Subscription will have attributes such food preferences and communication method. User Subscription is related to User and Product.

## Views

Surplus items for donation

Based on the product type - donation(from Product table), use User table and Product table to create a view, which will have attributes such as product name, inventory.

Surplus items with discount

Based on the product type - discount(from Product table), use User table and Product table to create a view, which will have attributes such as product name, inventory.

A diagram of a computer code

Description automatically generated with medium confidence

# Security Architecture

1. Validate log-in information (user name and password) to access the role.

2. Implement role-based access control to ensure that users only have access to the features and data appropriate for their role (e.g., retailers should not have access to consumer data).

# Deployment Architecture

## 1.Server Setup:

Initially, Apache Tomcat needs to be installed on the designated server to serve as the hosting environment for the Food Waste Reduction Platform (FWRP) website.

## 2.App Deployment:

Following the server setup, the FWRP application must be deployed onto the Apache Tomcat server. This deployment process ensures that users can access the application through their web browsers.

## 3.Database Configuration:

Concurrently, configuration of the FWRP database is essential. This database serves as the central repository for storing and managing all data associated with the application, including user information, inventory data, and transaction records.

## 4.Accessibility Configuration:

Once the application is deployed, configurations within Apache Tomcat need to be adjusted to ensure seamless accessibility for users. This involves setting up appropriate web server settings and security measures to facilitate user interactions with the platform.

## 5.Scaling Strategy:

As user traffic and demand for the FWRP application increase over time, a scalable deployment strategy becomes imperative. Initially, starting with a single instance of Apache Tomcat may suffice. However, as the application gains popularity and experiences higher traffic volumes, the addition of more Tomcat instances or implementing load balancing techniques becomes necessary to maintain optimal performance and user experience.

# Testing Model

## 1.Manual Testing:

Manual testing is essential to verify that the application functions as intended. Testers interact with the application's user interface and functionalities to identify any potential issues or bugs.

## 2. Unit Testing:

Unit testing focuses on testing individual components or modules of the application in isolation. By isolating each component, developers can ensure that they function correctly and meet the specified requirements.

## 3. Integration Testing:

Integration testing is conducted to validate the interactions between different components of the application. This ensures that various modules work together seamlessly, and that data is exchanged accurately between them.

## 4. API Testing:

API testing involves testing the application's APIs (Application Programming Interfaces) to ensure they perform as expected. This includes verifying the correctness of API responses and assessing their reliability and security.

## 5. User Testing:

User testing, also known as usability testing, involves gathering feedback from real users to assess the application's usability and user experience. This feedback helps identify areas for improvement and ensures that the application meets the needs of its target audience.

## 6. Load Testing:

Load testing evaluates the application's performance under simulated load conditions. By subjecting the application to high levels of concurrent user traffic, testers can assess its scalability, responsiveness, and stability.

# Bonus Functionality:

We will have a admin user that can manage all the user account. They have the functionality to delete user account directly from the website.