

Food delivery website and application

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1 INTRODUCTION

With the rapid development of information technology, web application and Android application have been increasing in recent years. Compared with the desktop application, the advantages of web application for users are:

- No need to install and update
- Easily visit through browsers

The advantage of the Android application:

- Mobile application is convenient to carry
- Global partnerships and large install base
- Powerful development framework
- Open marketplace for distributing apps

Based on the advantages of both applications, I motivated myself to develop a combination project between web and Android application.

Tom Yum Thai Restaurant in Vaasa sells Chinese and Thai food. Due to the cheaper prices and delicious food, more and more people select to eat in this restaurant. Meanwhile, with the number of customers increasing, the new problem occurs. Because the space of the restaurant is limited, the restaurant can only seat a certain number of customers at the time, therefore, the full customer resource cannot be utilized.

Mobile Food Ordering Application is the key to solve this problem. Using this application, the customers need not go to the restaurant by themselves, but they can order the dishes through computers and Android mobiles anywhere.

The Background Management platform in this application was designed for the administrator. The Administrator will be able to manage food dishes, dish orders and company employees here.

2 TECHNOLOGY OVERVIEW

The administrator part was developed with struts2 framework, spring framework and JPA framework, while the display part of website for customers is implemented with servlet/JSP. MySql was chosen as a database for the project. The Android part was developed with the Android framework. Following the core frameworks will be generally introduced in this application.

2.1 Struts 2 Framework

“Apache Struts 2 is an elegant, extensible framework for creating enterprise-ready Java web applications.” /1/

Struts 2, the next generation product of Struts, is the new framework merged based on Struts 1 framework technology and WebWork framework technology. The core of Struts 2 is WebWork. /1/

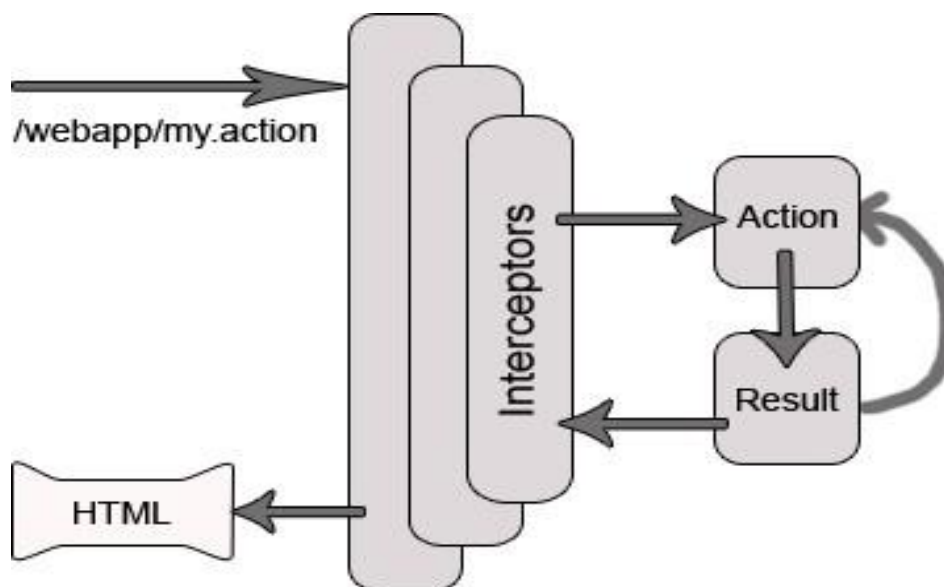


Figure 1. Struts 2 request processing/2/

As shown in Figure 1, it illustrates the Request Lifecycle in Struts2 applications. When the FilterDispatcher in the server receives the request sent from the user, it will determine the appropriate Action. As the same time, interceptors configured for applying the common functions, such as validation and file upload are applied to the Request. Then the action method executes the related operations and the Result renders the output. Then the request returns through the interceptor in the reverse order. Finally the control returned in the servlet container will send the output to the user browser. /2/

The Struts 2 allows us to define exception handlers and inceptors. Using the exception handler, we can define the exception-handling procedure on global and local basis. When the framework catches the exception, it will display the exception details information on the page. The inceptors configured to apply the functionalities, such as workflow, validation etc. are used to specify the “request-processing lifecycle” for an action. /2/

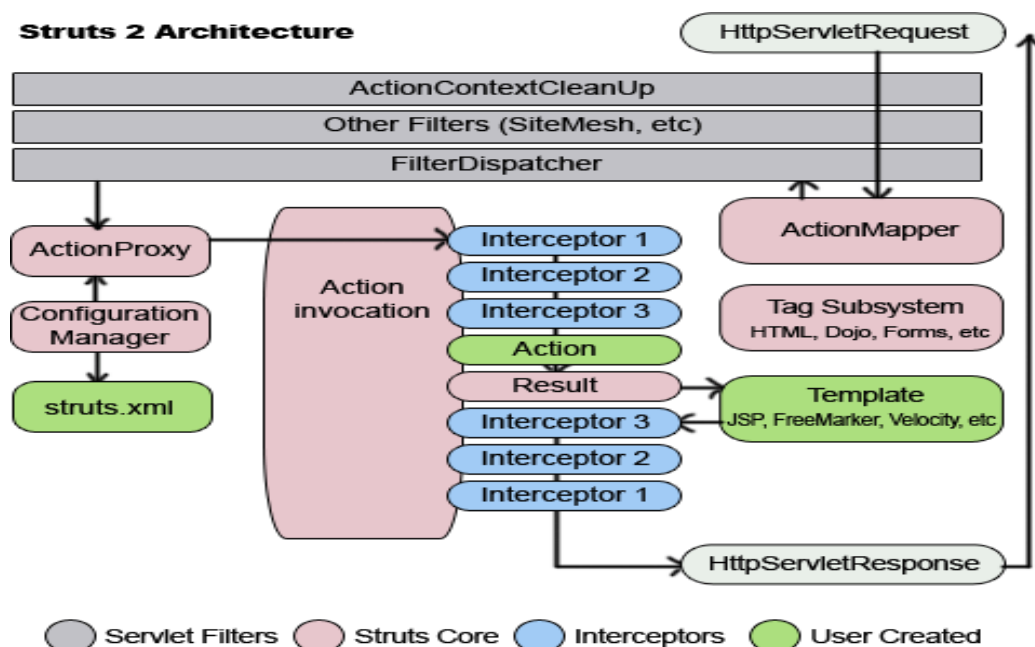


Figure 2. Struts 2 Architecture/2/

Figure 2 depicts the architecture of Struts 2 Framework. It also shows the initial request going to the servlet container, such as tomcat, which is then passed through the standard filter chain. The filter chain includes: ActionContextCleanUp filter, FilterDispatcher and ActionProxy. /2/

- ActionContextCleanUp filter:

This filter is optional and useful when integration has to be done with other technologies. /2/

- FilterDispatcher:

The FilterDispatcher uses the ActionMapper to determine whether to invoke an Action or not when it is called. If the action needs to be invoked, the FilterDispatcher delegates the control to the ActionProxy. /2/

- ActionProxy:

The ActionProxy takes help from the Configuration Files manager initialized from the struts.xml. Then the ActionProxy creates an ActionInvocation. The ActionInvocation process invokes the Interceptors (if configured) and the action. The ActionInvocation looks for a proper result. Then the result that involves the rendering of JSP or templates is executed. /2/

The Interceptors are executed again in the reverse order. Finally the response returns through the filters configured in the web.xml file. The ThreadLocal ActionContext will not be cleaned if the ActionContextCleanUp filter is configured, otherwise. /2/

2.2 Spring Framework

This section gives details about all the modules available in Spring Framework. About 20 modules, which can be used based on an application requirement, are provided in the Spring Framework.

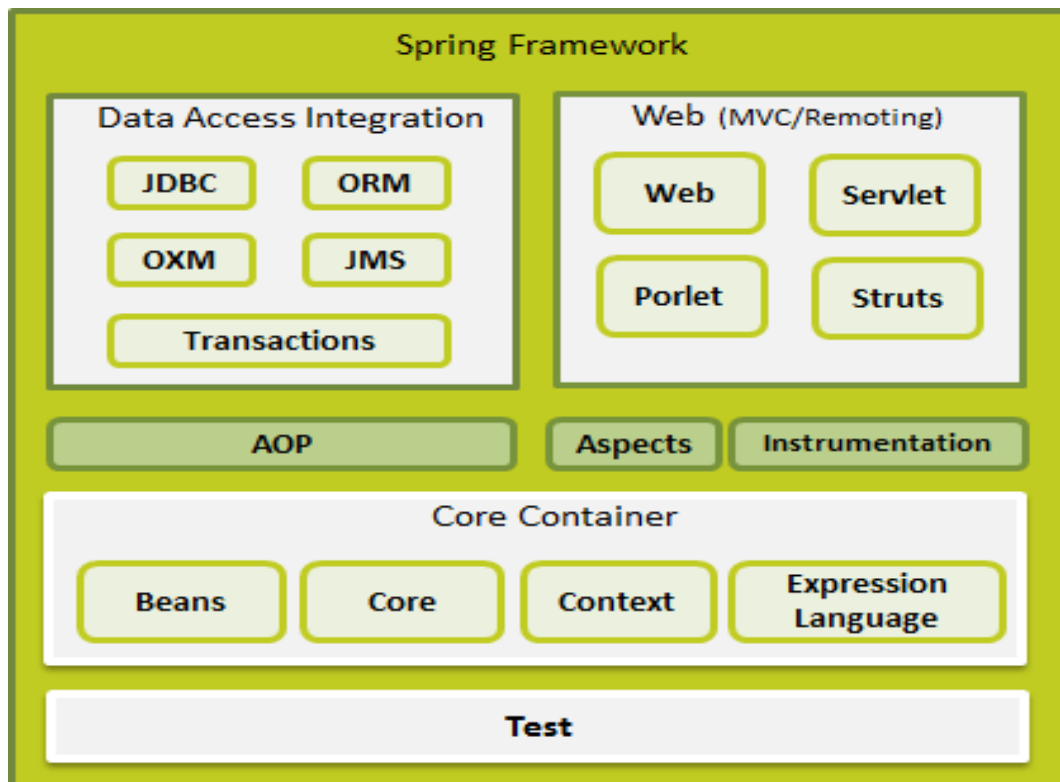


Figure 3. Spring Framework Architecture /3/

The main layers seen in Figure 3 will be described below.

- Core Container:

The Bean module provides BeanFactory. The Core module provides the functional parts of framework, including the IoC and Dependency Injection features. The Context module builds on the solid base provided by the Core and Beans module and it is a medium to access any objects defined and configured. The ApplicationContext interface is the focal point of the Context

module. The Express Language module provides a powerful expression language for querying and manipulating an object graph at runtime. /3/

- Data Access/Integration:

The JDBC module provides a JDBC-abstraction layer that removes the need to do tedious JDBC related coding. The ORM module provides integration layers for popular object-relational mapping APIs, including JPA, JDO, Hibernate, and iBatis. The OXM module provides an abstraction layer that supports Object/XML mapping implementations for JAXB, Castor, XMLBeans, JiBX and XStream. The JMS module contains features for producing and consuming messages. The Transaction module supports programmatic and declarative transaction management for classes that implement special interfaces and for all your POJOs. /3/

- Web:

The Web module provides basic web-oriented integration features such as multipart file-upload functionality and the initialization of the IoC container using servlet listeners and a web-oriented application context. The Web-Servlet module contains Spring's module-view-controller (MVC) implementation for web applications. The Web-Struts module contains the support classes for integrating a classic Struts web tier within a Spring application. The Web-Portlet module provides the MVC implementation to be used in a portlet environment and mirrors the functionality of Web-Servlet module. /3/

- Miscellaneous:

The AOP module provides an aspect-oriented programming implementation allowing the definition of method-interceptors and pointcuts to cleanly decouple a code that implements functionality that should be separated. The Aspects module provides integration with AspectJ that is again a powerful and mature aspect oriented programming (AOP) framework. The Instrumentation module provides class instrumentation support and class

loader implementation to be used in certain application servers. The Test module supports the testing of Spring components with JUnit or TestNG frameworks. /3/

2.3 JPA Framework

“The Java Persistence API, sometimes referred to as JPA, is a Java programming language application programming interface specification which describes the management of relational data in application using Java Platform, Standard edition and Java Platform, Enterprise Edition.” /4/

Persistence in this context covers three areas: /4/

1. the API itself, defines in the javax.persistence package
2. the Java Persistence Query Language (JPQL)
3. object/relational metadata

2.4 Android Framework

Android is known as a mobile operating system based on the Linux Kernel. It is mainly designed for touchscreen mobile devices such as smartphone and table computers. Meanwhile, the Android operating system is widely used in televisions, games consoles, digital cameras and other electronics because of its open and customizable features. Android was developed initially by Android, Inc. and bought by Google in 2005. /5/

The source code for Android is available under free and open-source software licenses. It means that the device manufactures, wireless carriers and enthusiast developers can freely modify and distribute the software. Most Android devices ship with a combination of open source and proprietary. /5/

Today, Android has become the most popular mobile OS, and is the leader in smartphone market in the world. More and more customers select mobile phones

with the Android operating system as their first choice. Meanwhile, mounts of programmers throw themselves into the Android application development camp.

The major features of Android architecture are shown as shown in Figure 4 below.



Figure 4. Android Architecture/5/

- **Linux Kernel**

At the bottom of the layers is Linux Kernel. It provides a basic system functionality, such as memory management, device management etc. Also, it handles the things that Linux is good at such as networking.

- Libraries

On top of Linux Kernel is a set of libraries including open-source Web browser engine WebKit, SQLite database, libraries to play and record audio and video, SSL libraries and so on.

- Android Runtime

This section provides a key component called Dalvik Virtual Machine that is a kind of Java Virtual Machine designed for Android. The Android runtime also offers a set of core libraries: it enables developers to develop Android applications using the standard Java programming language.

- Application Framework

The Application Framework layer provides many higher-level services to applications in the form of Java classes. Application developers are allowed to make use of these services in their applications.

- Applications

All the Android applications will be found at the top layer. The application written by the developer will be installed on this layer only.

3 APPLICATION DESCRIPTION

There are certain requirements the proposed application must fulfil to meet the objectives of the project.

The requirements to be achieved:

In Background Management Platform:

- Administrator can add and modify food categories.
- Administrator can add, modify and query food information.
- Administrator can add, modify and query employee information.
- Administrator can manage orders produced from the web application and Android application.

In the Website Public Page and Android Application:

- Customer can view food information, such as category, name, price, image, description and so on.
- Customer can order food.
- Customer can modify food item, food amount in Shopping Cart.
- Produce food order.

The requirements that should be achieved:

- The project supports internationalization, customer can select different language environments according to their real requirements.

The requirements nice to be achieved:

- Permission Management in Background Management Platform
- Query Dish Function in Website Public Page

3.1 Functional Description

Destine Food System is divided into two parts in terms of roles, the background for the administrator, the website foreground public pages and the Android application for user. Functions corresponding to each role will be introduced in detail in the following.

3.1.1 Background Management Platform

Figure 5 is a use case diagram to illustrate the main functions in the background for the administrator. The detailed description of functions is as follows:



Figure 5. Use Case diagram for administrator

Log In/Out

Properties:

- Username
- Password

When the administrator connects the background management platform url, a log in interface will be displayed. The administrator needs to input correct username and password to log into the main page of the background management page. One admin username and password is pre-set when the application is initialized.

Add Food Category

Properties:

- Category Name
- Note

When the administrator clicks “Category Manage”, a list view of dish category will be displayed. On the bottom of the list view page, there are two buttons: “Add Category” and “Query”. While clicking the “Add Category” button, the page will be linked to a dish-adding interface, the administrator can add a new dish category here.

Query Food Category

Properties:

- Category Name

Also, clicking the “Query” Button, a dish category query interface will be displayed, here the administrator can query current existing dish category according to the category name.

Modify Food Category

Properties:

➤ Category Name

➤ Note

In addition, in the category list view page, the administrator can modify the existing dish category by clicking “Modify” button.

Add Food Info

Properties:

➤ Product Name

➤ Product Category

➤ Market Price

➤ Sell Price

➤ Product Code

➤ Product Style Image

➤ Product Description

When the administrator wants to add dishes, “Product Manage” just needs to be clicked; the right frame page will jump to a list view page of dishes. On the page, the detailed information of existing dishes will be shown, such as Product Code, Product Name, Category Belong, Sell Price, the state of sale, etc.

Modify Food Info

Properties:

➤ Product Name

➤ Product Category

- Market Price
- Sell Price
- Product Code
- Product Style Image
- Product Description

The administrator can modify food information by clicking “Modify“ button.

Query Food Info

Properties:

- Product Name
- Product Category
- Sell Price
- Product Code

The administrator can query food information according to different conditions above.

Sale/Stop to sale

In addition, this project provides “On Sale” and “Stop Sale” functions. Using these functions, the administrator can manage the state of dish sale.

Add Employee Info

Properties:

- Login Account
- Login Password

- Repeat Password
- Employee Name
- Employee Photo
- Id Number
- Birthday
- Address
- Telephone
- Email (optional)
- Degree (optional)
- School (optional)

In the Employee Management module, the administrator can view the information of existing employees in the company by clicking “Employee Manage”. The functions of “Add” and “Modify employee” are also provided in the project. The employee accounts added can be used to log in this background management platform. In addition, according to the real request, when an employee leaves the company, the administrator can mark leave for this employee using “Mark Leave” function, it means that the employee account will be invalid to log in the background management platform.

Query Employee Info

Properties:

- User Name
- Real Name

By clicking the “Employee Query” link, the administrator can query company employees by the user name (log in account) or the employee’s real name.

Change Order States

Figure 6 is a use case diagram for the order flow to illustrate the flow of order state. When the customer purchases the dishes no matter what platform they are in (website or Android application). The order of dishes will be produced and showed in the background management platform.

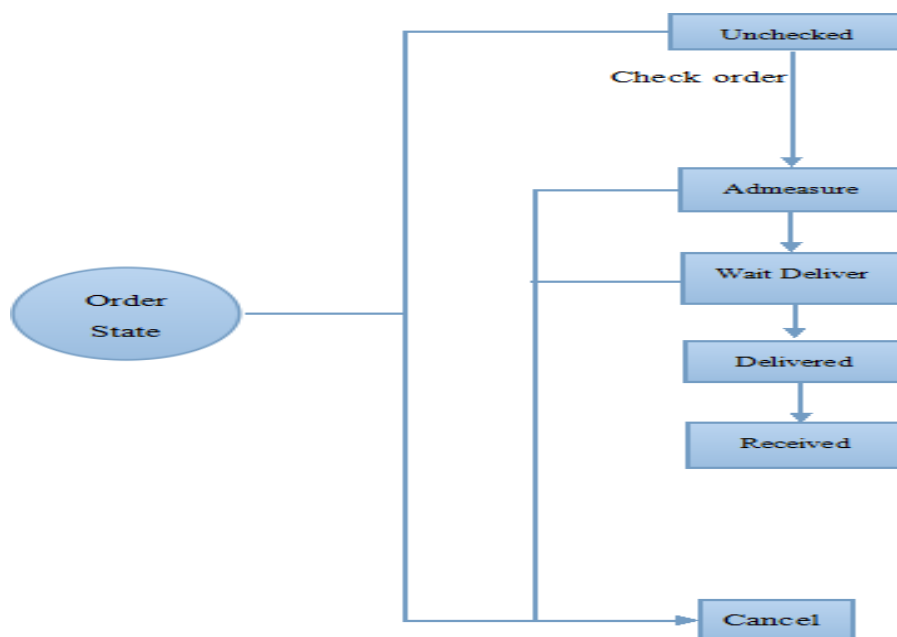


Figure 6. Order state changing flow

The dish order is divided into five states: Unexamined, Wait Deliver, Delivered, Received and Cancelled. The default state of produced order is Unexamined, the administrator can load the order to check the detailed information, for example, dish items, amount, price and customer information. After checking the Unexamined order, the administrator can decide to change the state of order, if the order is examined, the order state is changed to Wait Deliver, otherwise, the state is changed to Cancelled. As the simpler flow, the order state goes through Delivered, till Received. When order in Unexamined, Wait Deliver, Delivered,

Received state, it can be cancelled, once the dish is delivered, the order cannot be cancelled. In the Order Manage module, this project provides five order state links, “Order Unexamined”, “Order Wait Deliver”, “Order Delivered”, “Order Received”, “Order Cancelled”. In each link, there are the orders of related state. In addition, the “Order Query” link is used to query the order according to Order Code Or Buyer Name.

3.1.2 Website Foreground Public Page

Figure 7 shows the core functions provided for customers in this application.

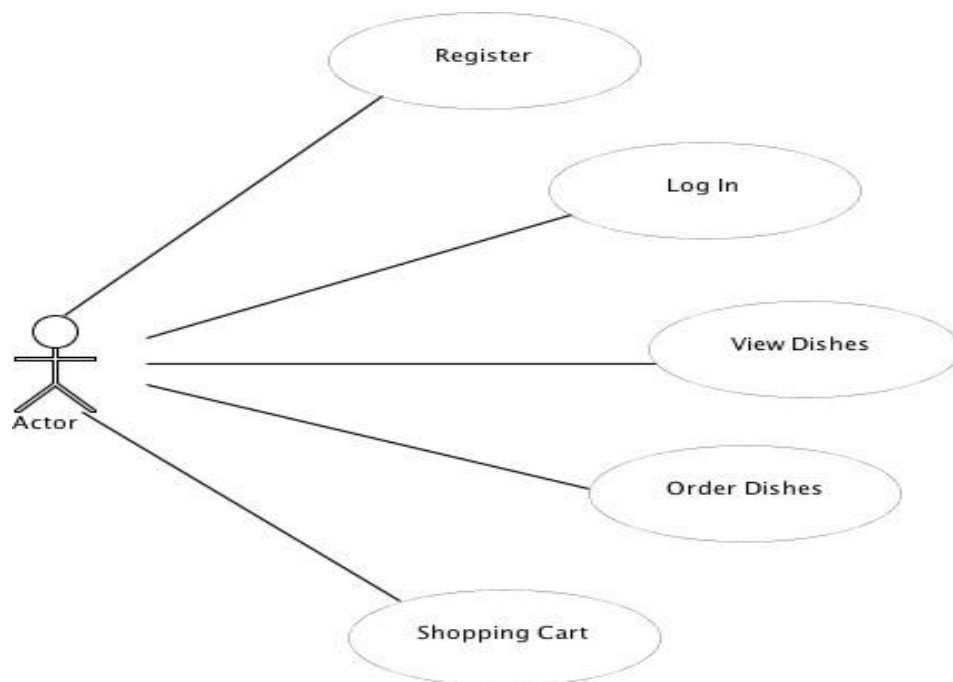


Figure 7. Use case diagram for customer

Register

When the customer wants to purchase dishes on the website, first, he needs to register an account by clicking “Register” button to enter the register page, and then just filling in User Name, Password and Repeat Password. If the customer

register is successful, a page will display to inform the customer, also if there is a register fault, such as the User Name already exists, a friendly warning message will be given on the register page. Note that in the register form, there is a validation function written by JavaScript to validate whether the information filled by the customer is valid or not. Only if all information is valid, the operation of register will be successful.

Log In

After registering, the customer can log in with the correct User Name and Password to the website to purchase the dishes.

View Dishes

To click “Online Order” tab, the customer can view the current dishes according to different categories. Every dish item has two buttons: Order and Detail. The customer can click the “Detail” Button to view the detailed information (big image, material of dish, price, etc.) of dishes. By clicking “Order” Button, the dish item you select will be added to the shopping cart.

Shopping Cart

The dish items purchased by the customer will be added to the shopping cart. The customer can view the dish items he/she purchases, unit price, dish amount and total price. The default amount for each dish item is one, the customer can update the amount according to his own requirement. After modifying the amount, customer needs to click “Update” button to update the dish amount. Also, if the customer needs to delete some dish item, it is easily implemented by clicking “Delete” Button following each dish item. On this Shopping Cart page, three buttons (“Clear Cart”, “Continue to Buy”, “Produce Order”) are shown. “Clear Cart” button means that the customer can delete all dish items in the shopping cart. To click “Continue to Buy” button, the page will be linked to dishes display page, the customer can continue shopping. By Clicking “Produce Order” Button, the application will produce an order for dish items purchased by the customer, the order produced will shown in background management platform. At the same

time, the remainder of the page will display to inform the customer. This is the entire purchasing process for the customer to order dish on the website platform.

3.1.3 Android Application

The Android application also provides the similar functions to those on website foreground public page.

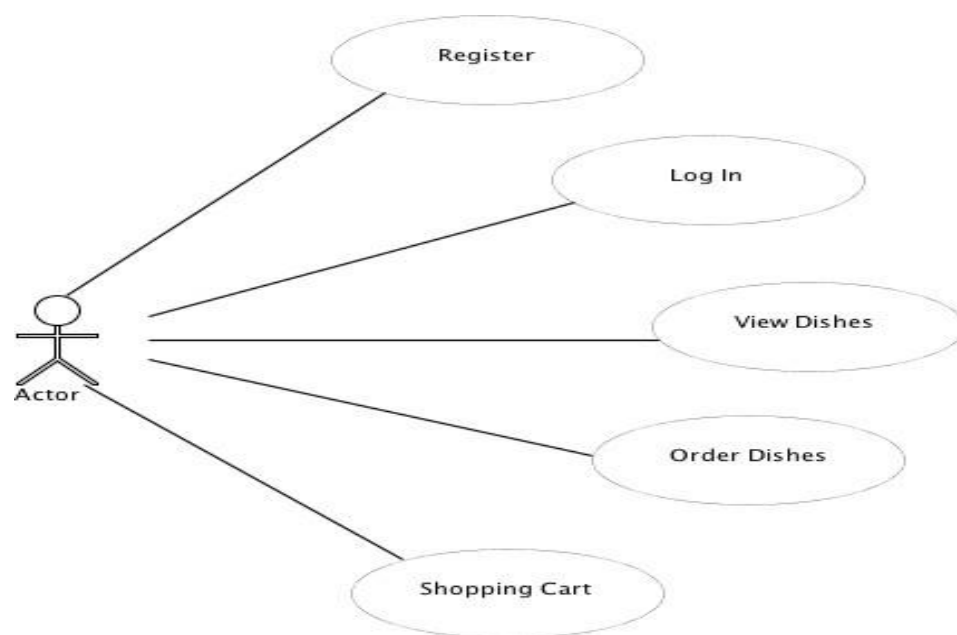


Figure 8. Use case diagram for customer in Android Application

Register

Compared with the website foreground public pages, the customer must register an account first to view the information of dishes. When the customer launches the Destine Food Client application on an Android mobile, a pop-up window will display. The customer needs click the “Register” Button for the first time to use this application. After clicking, the customer will see the Register window, then he needs to fill in a valid username and password to finish the registering task.

When the customer's registering is successful, the window will jump back to the log in window automatically.

Log In

When the customer has a valid account, just fill the username and password in related fields, then "Enter" Button is clicked, and the dishes display window will be shown. At the same time, if the customer wants to enjoy the music while ordering dishes, the music play button is given.

View Dishes

In the dishes display window, there are three tab views for three different dish categories. Each tab view contains the corresponding dishes. The customer can view the dish information via clicking the tab views. To click some dish item, the optional menu will come out, and the customer can view the details of dish or add the dish to the shopping cart.

Shopping Cart

Once the customer clicks the "Add to Cart" button, the pop-up window of dish amount will appear, in this window, the customer needs to fill in the integer number and click "Order" button to confirm. Now the customer should go to the shopping cart window. The dish items the customer ordered will be shown as a list view here. The application will calculate the sub price and total price automatically. If the customer wants to delete some dish item or modify the dish amount, clicking anywhere of the dish item row will produce a pop-up window to display to let the customer do related operations. In addition, the customer also can clear the shopping cart, continue to purchase dishes and confirm the order similarly to the operations on the website. Also, the produced order will be shown in the background management platform.

3.2 Class Hierarchy

3.2.1 Background Management Platform

The Background Management Platform part is architected with Struts2 framework, Spring framework and JPA framework, and it makes use of classical concept known as MVC, short for model, view and controller. This inside structure will be analysed in detail in the following.

3.2.1.1 Controller Class Diagram

Order Module:

As Figure 9 shows, the administrator can change the state of dish order by using these methods.

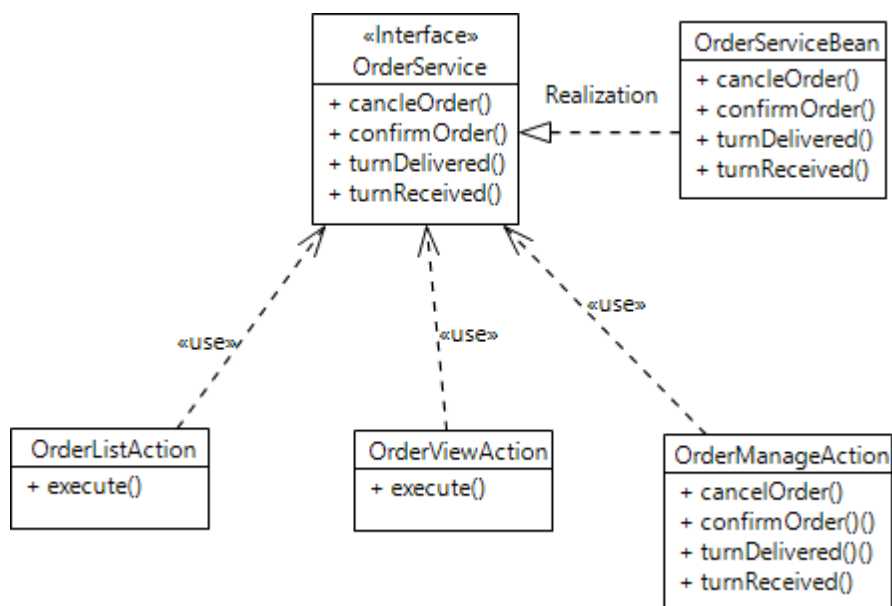


Figure 9. Order Module Controller Structure

- `execute()`:

Implement this method to jump to a JSP page.

- `cancleOrder()`:

Cancel the dish order.

- `confirmOrder()`:

Change order state from “Unexamined” to “Wait Deliver”

- `turnDelivered()`:

Change order state from “Wait Deliver” to “Delivered”

- `turnReceived()`:

Change order state from “Delivered” to “Received”

Employee Module:

The administrator can make a series of operations shown in Figure 10 regarding employees. Also, employees can use their own function given in the system, such as log in, log out and so on.

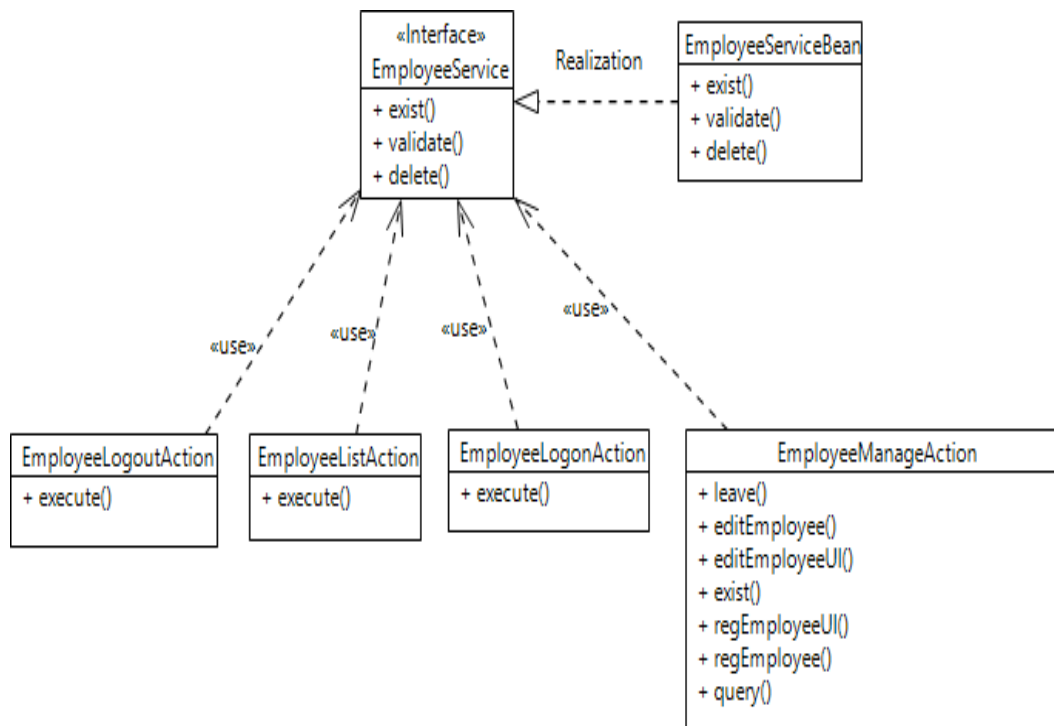


Figure 10. Employee Module Controller Structure

- **execute():**

Implement this method to jump to a JSP page.

- **editEmployee():**

Modify the current existing employee information.

- **editEmployeeUI():**

Jump to modify employee information page.

- **exist():**

Measure whether the employee account exists or not when registering.

- **leave():**

Mark an employee in leave situation when an employee leaves company.

- query():

Query an employee according to the account name or employee's real name.

- regEmployee():

Employee registers.

- regEmployeeUI():

Jump to employee register page.

Product Module:

In the product module, the administrator can control the related operations for dishes.

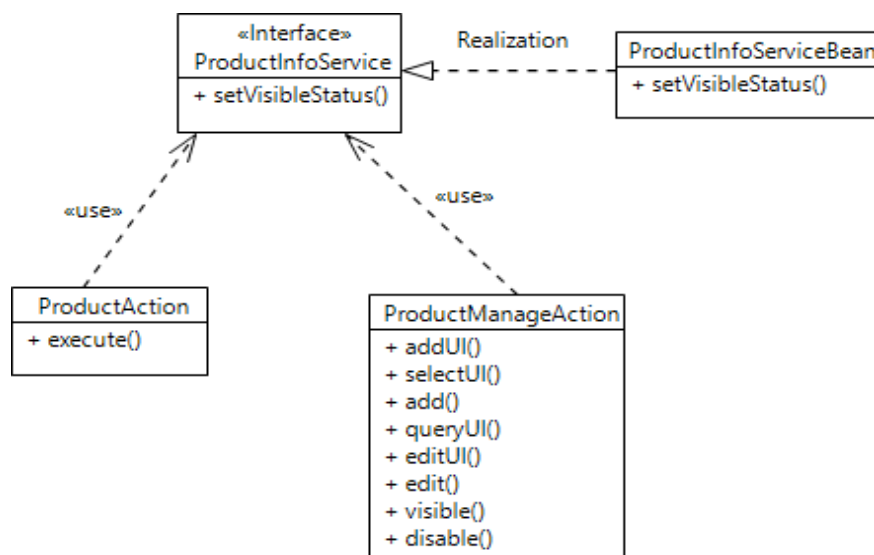


Figure 11. Product Module Controller Structure

- `execute()`:

Implement this method to jump to a JSP page.

- `disable()`:

Stop to sale some dish.

- `add()`:

Add dishes.

- `edit()`:

Edit current existing dish.

- `editUI()`:

Jump to edit dish page.

- `queryUI()`:

Jump to query dish UI

- `selectUI()`:

Select dish category for dish when adding a dish.

- `visible()`:

Start to sell a dish corresponding to stop to sale some dishes

3.2.1.2 View Class Diagram

The view layer mainly takes in charge of JSP display pages in the foreground.

3.2.1.3 Model Class Diagram

These POJO classes in the diagram in Figure 12 define their own entities in this project meanwhile building a mapping with relative tables in the database.

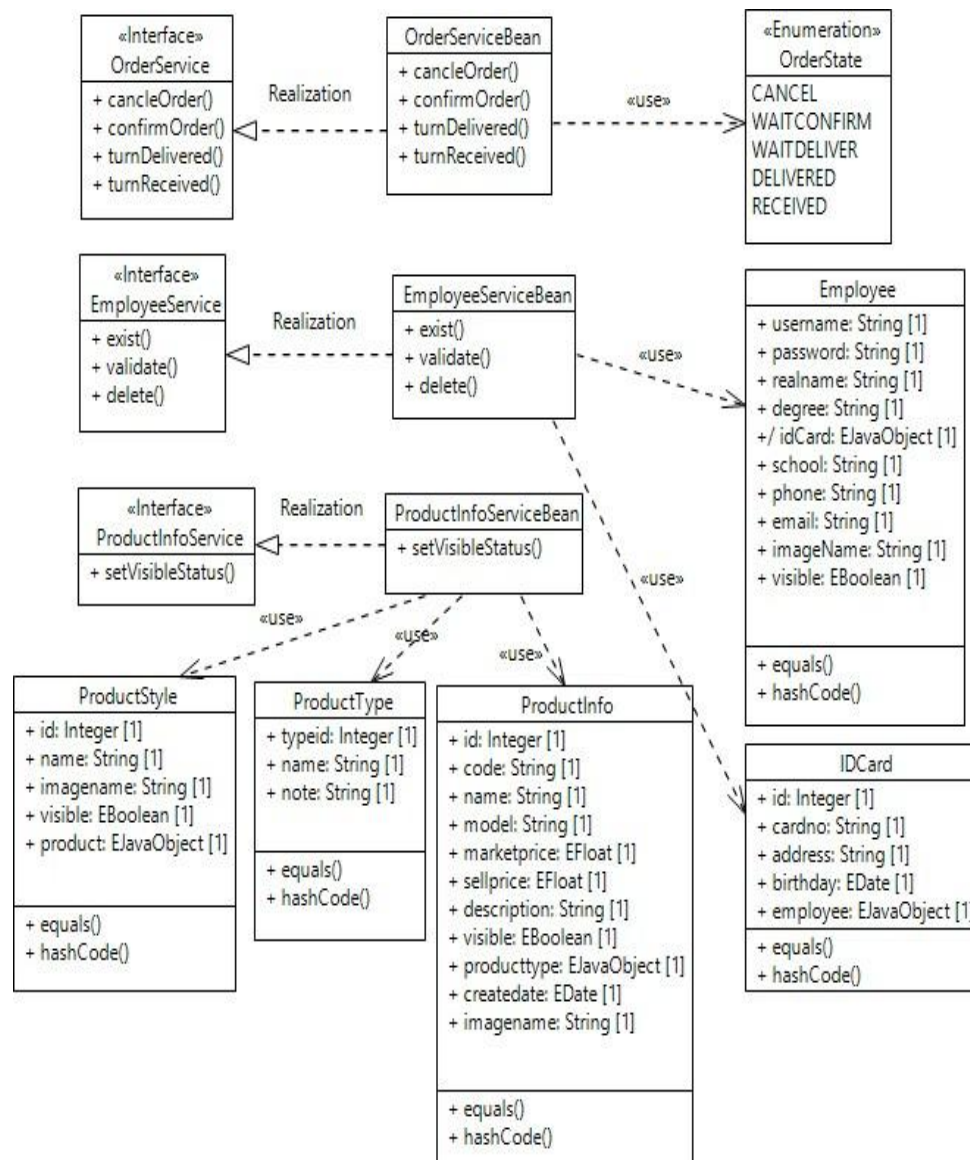


Figure 12. Module Structure

As a consequence, each row of POJO attribute is relative to corresponding attribute in tables (Object/Relational Mapping).

3.2.2 Website Foreground Public Page and Android Application

The Website Foreground Public Page part and the Android Application still make use of MVC structure. Compared with the Background Management platform, the technology used for the controller layer is a servlet.

3.2.2.1 Controller Class Diagram

Controller layer in Website Foreground Public page is servlet. The main methods called by servlet are described below.

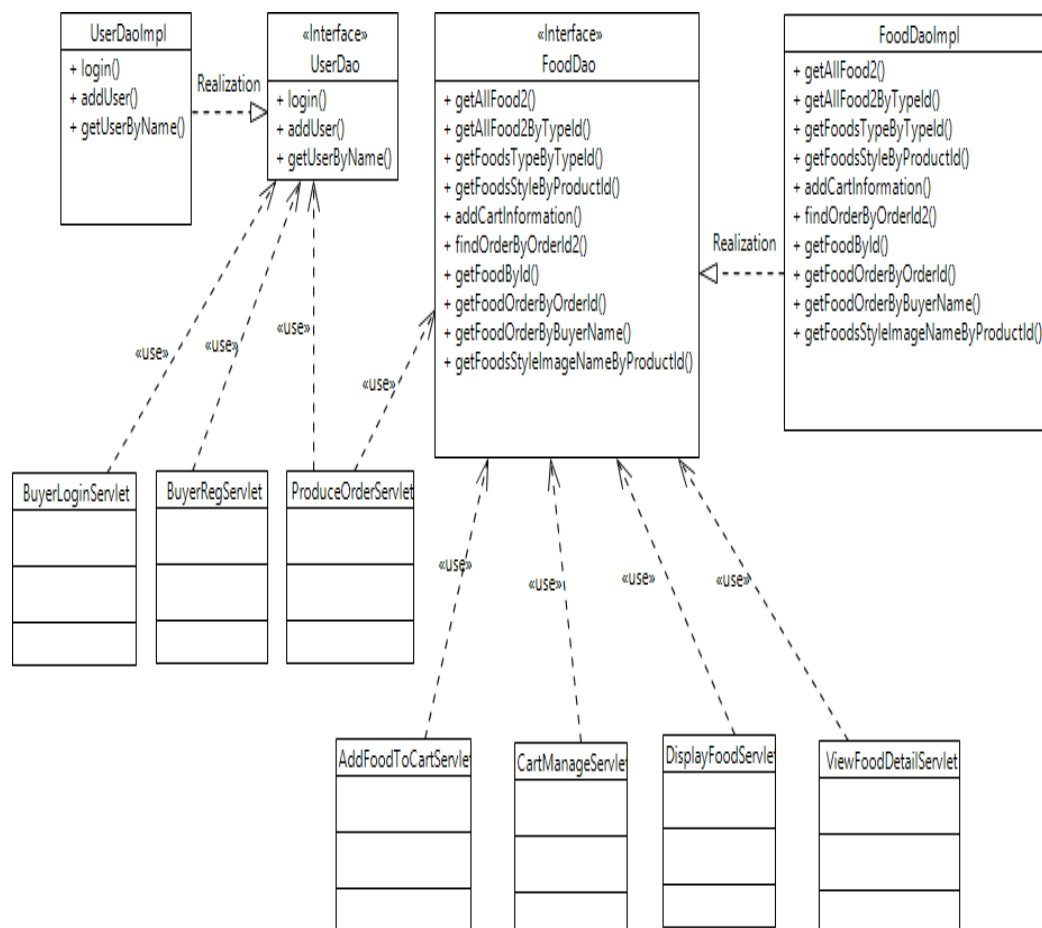


Figure 13. Controller structure in Website Foreground Public Page

- `getAllFood2():`

Get all dishes information for displaying on the website public page.

- `getAllFood2ById():`

According to type id, get all dishes belonging to some category.

- `getFoodsTypeById():`

Get all dish categories in order to display dishes according to different categories.

- `getFoodsStyleById():`

According to dish id, find dish image.

- `addCartInformation():`

Add dish amount and dish id to shopping cart.

- `findOrderById():`

Find order by order id, return type is list.

- `findOrderById2():`

Find order by order id, return type is OrderItem, an entity bean contains some properties of dish item.

- `getFoodById():`

Get Food Entity according to food id.

- `getFoodOrderById():`

Get food order according to order id.

- `getFoodOrderByBuyerName():`

Find food order according to buyer's name.

- `getFoodsStyleImageNameByProductId()`:

Fetch some dish image name according to dish id.

- `Login()`:

Customer logs in the website when purchasing dishes.

- `addUser()`:

Customer registers in to the website.

- `getUserByName()`:

Query the user by name in order to validate whether the user name exists or not.

Customers do operations in Android Application, application sends request with data to server, and then servlet in server will handle data and response data to android application. Therefore, in Android Application, the controller layer is still servlet. Also, the main methods in servlet will be given as follow.

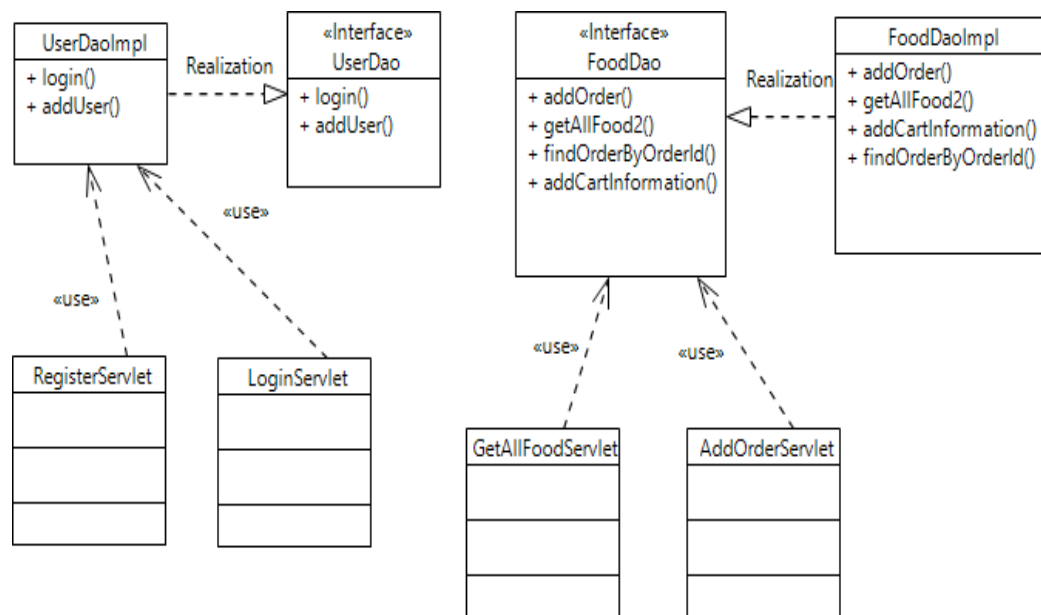


Figure 14. Controller structure in Android Application

- **login():**

Customer logs in the Android application platform to purchase dishes.

- **addUser():**

Customer registers in the Android application before purchasing dishes.

- **addOrder():**

Insert customers deliver information to the database.

- **getAllFood2():**

Return all dishes information from website.

- **findOrderByOrderId():**

Get some order according to order id.

- addCartInformation():

Insert customers' order detailed dishes information to database.

3.2.2.2 View Class Diagram

The view layer on the Website Foreground Public Page still includes some JSP page to display on the foreground public pages. In the Android Application, the view layer mainly takes in charge of the layout xml files.

3.2.2.3 Model Class Diagram

Below is the module structure in Android Application. The entities in these POJO classes also build a mapping with relative table in the MySQL database.

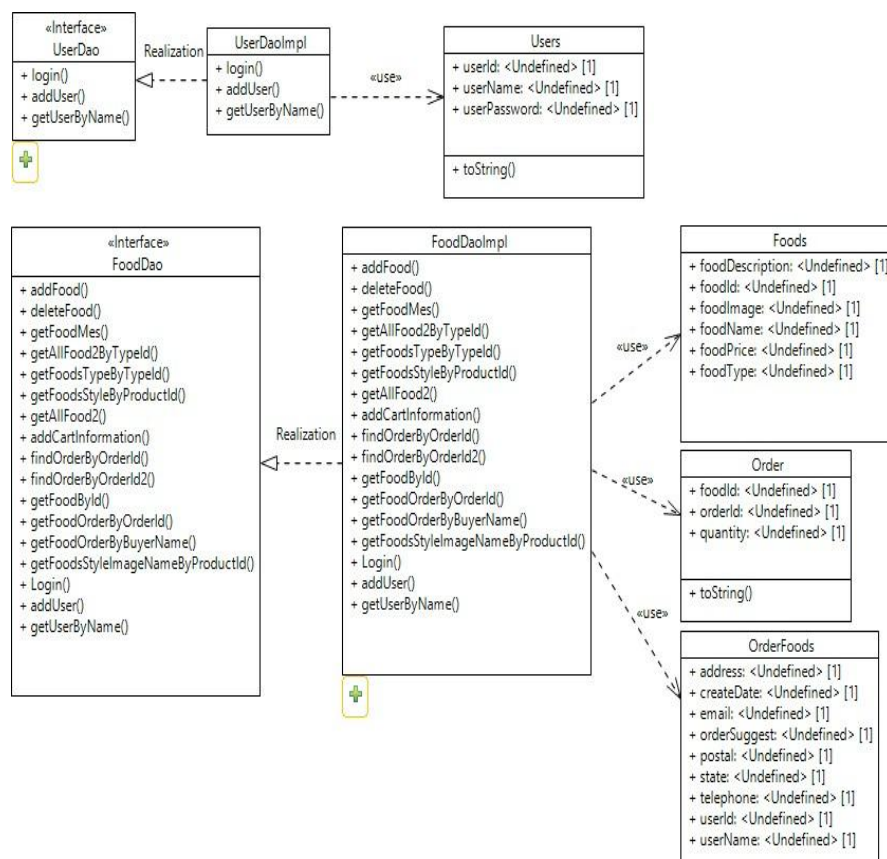


Figure 15. Module structure

Also, every POJO class is an entity bean containing some attributes, building a mapping with relative tables in the database.

3.2 Sequence Diagram

The sequence diagram of main modules in Background Management Platform shows here. Since Website Foreground Public Page and Android Application have the same purchase sequence logic, so the purchase sequence in these both platforms will be analysed in this chapter as well.

3.2.2 Background Management Platform

There are five main modules, such as Log In Module, Category Management Module, Product Info Management Module, Employee Management Module and Order Management Module. The sequence diagram will be given separately below.

3.2.2.1 Log In

The administrator needs to login first before using the Background Management Platform. An account username and password for the owner of company will be pre-setted when the project is initialized.

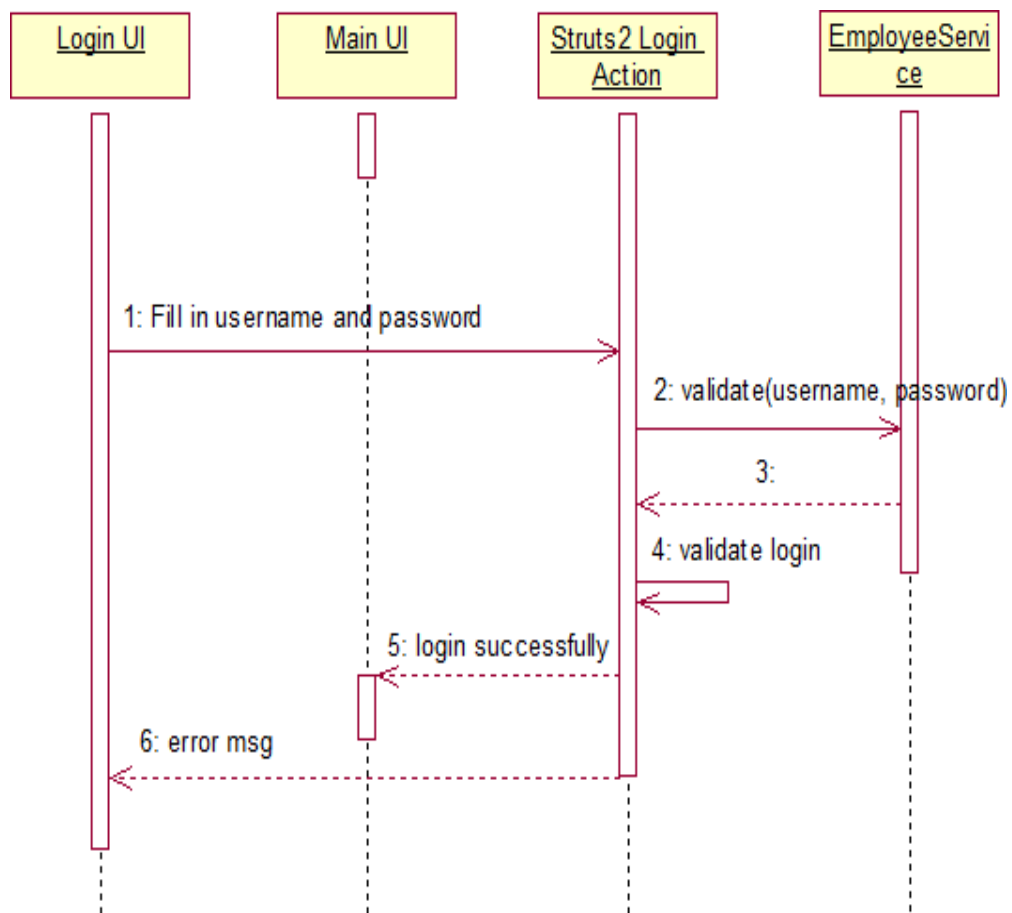


Figure 16. Background Management Platform Login

The administrator fills in the username and password in the related fields and presses the login button. If the login is successful, the url will direct to the Background Management Platform main UI, otherwise, the user will be notified with an error message.

3.2.2.2 Category Management

Application provides function to allow customers to view dishes according to different categories. Therefore, administrator needs to add to categories first.

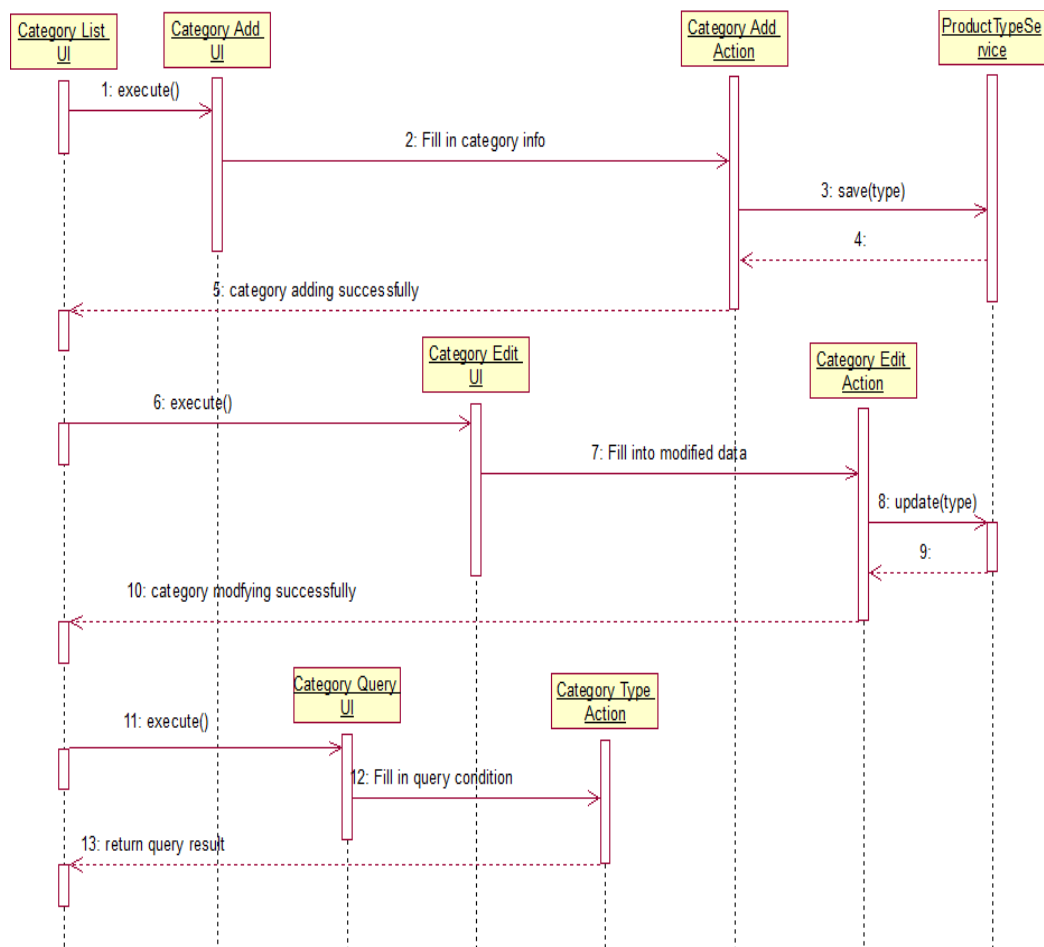


Figure 17. Product Category Management

To add dish to display on the website or Android, the administrator should add dish categories first, in order that display dishes according to different categories.

1. Add Category:

In the Product Management, by clicking “Category Manage”, a list view page of current existing dishes will be shown. By clicking “Add Category” button, the right frame will jump to the category adding UI. Required data is filled in, then it is confirmed, and a dish will be added successfully. At the same time, the right frame will jump back to the category list view page, the new added dish will be displayed on this page.

2. Modify Category:

On the category list view page, every category item provides a “Modify” button, by using this button, the administrator can modify the existing dish information.

3. Query Category:

In addition, there is a “Query” button. This button can help the administrator to query some dish category among lots of categories.

3.2.2.3 Product Info Management

After adding categories, administrator can add dishes belong to different categories in Product Management module.

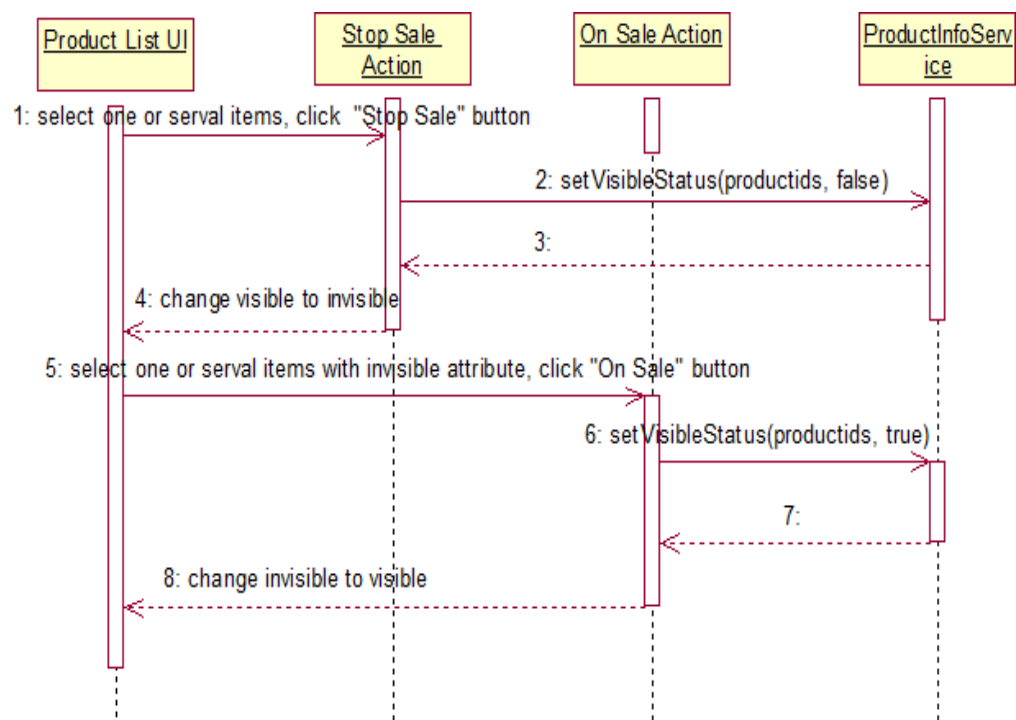


Figure 18. Product Information Management

In the Product Management, there is a similar logic to that in Product Category Management, such as adding, modifying and querying. Therefore, no detailed description is given here.

Stop or start selling

On the product list view page, there are two buttons: On Sale and Stop Sale. By using these two button, the administrator can control the sale state of food dish in order to display or remove a food dish on the website foreground public page or the Android application.

3.2.2.4 Employee Management

The Employee Management also has a similar logic to that referred above. The Mark Leave logic is also the same with the change sale state of food dishes. The employee accounts added by the administrator are used to log in and make use of the background management platform. Once the administrator marks an employee's leave, the employee account will not log in and use this platform any more.

3.2.2.5 Order Management

As mentioned in use case diagram for order flow, figure 19 demonstrates the entire ordering progress.

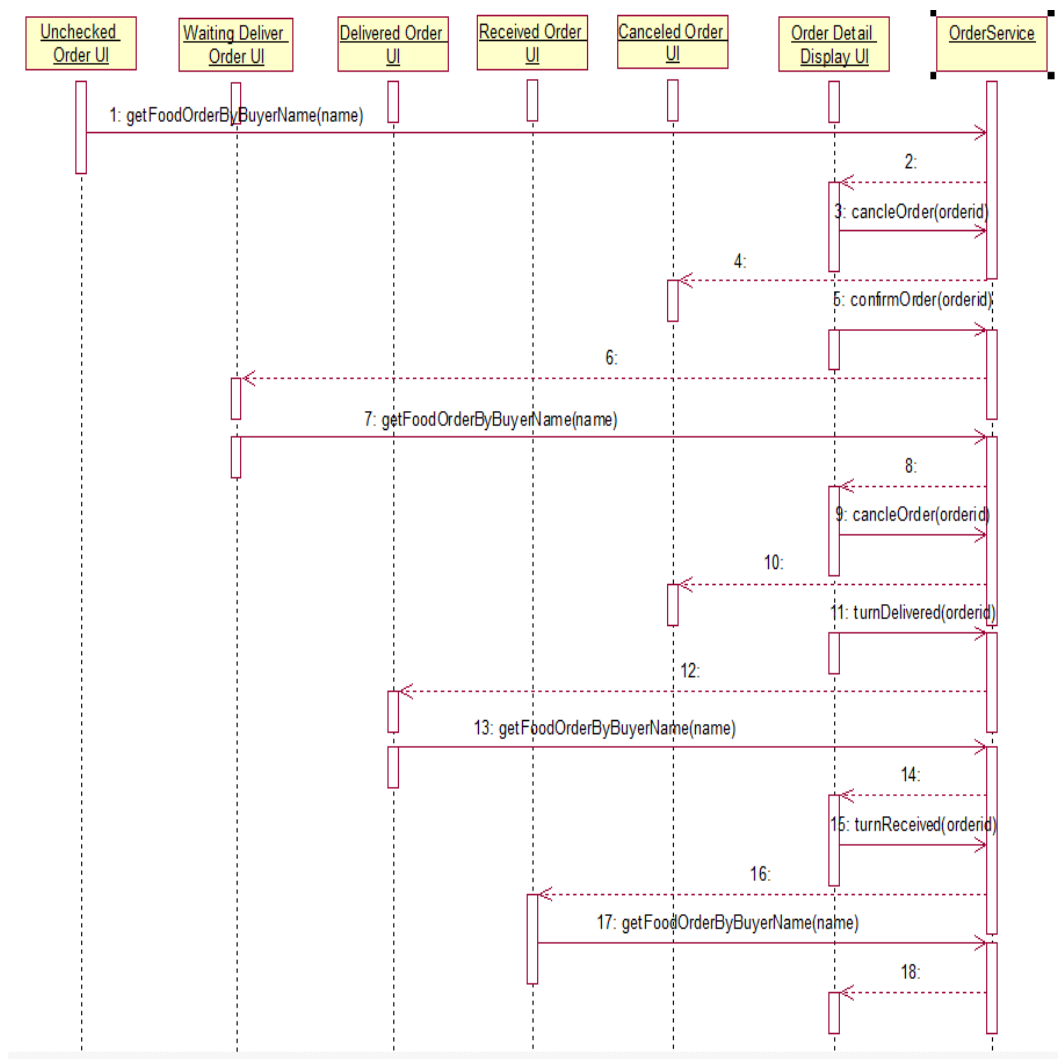


Figure 19. Order Management

The default state of produced order is unchecked, and the administrator can decide to change the state to waiting deliver or cancel. For waiting deliver state order, the administrator can change state to delivered or cancel. But for delivered order, the state cannot be changed any more.

3.2.2 Website Foreground Public Page and Android Application

Purchasing function is the core function in this application. So the purchase sequence diagram will be analysed as follow.

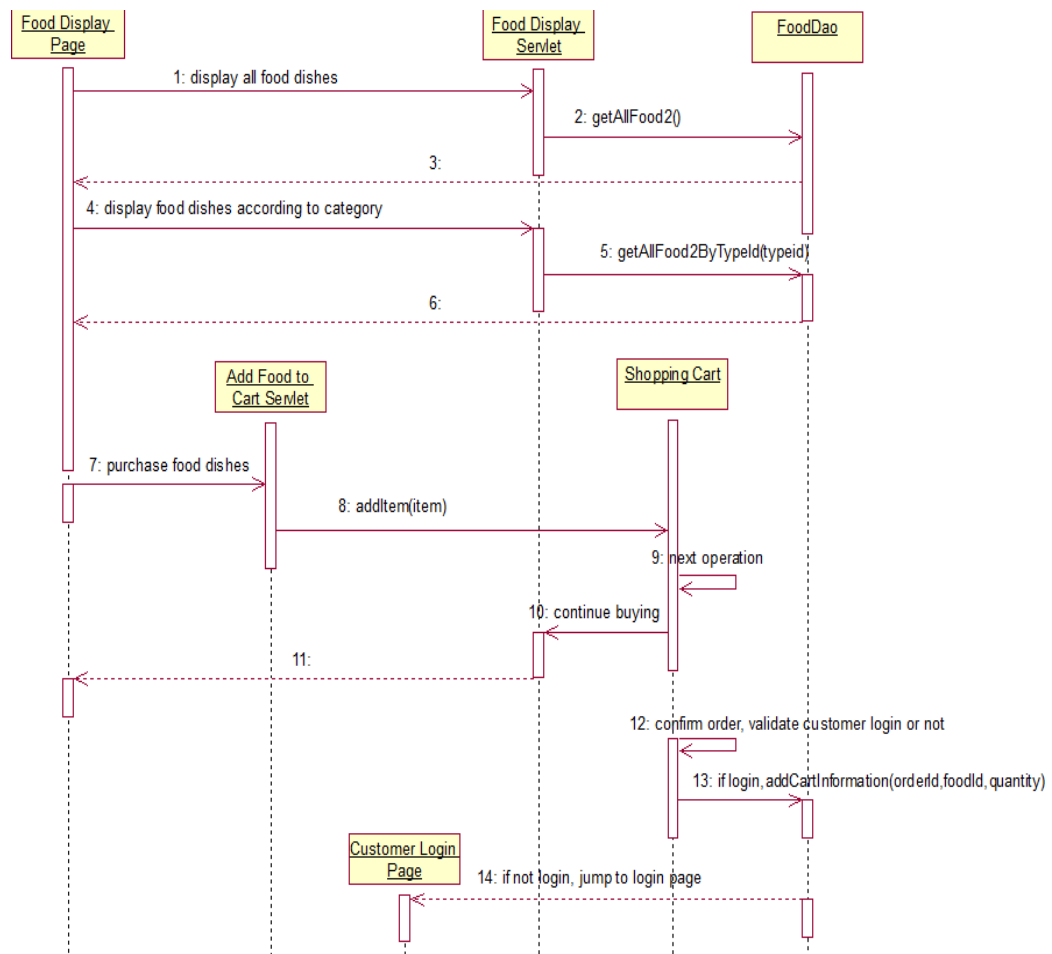


Figure 20. Customer Purchase sequence diagram

In the Website platform, the customer can view the information of food dishes without logging in. Before purchasing dishes, the customer needs to log in. The dish items purchased by the customer will be added to the shopping cart temporarily. In the shopping cart, the customer can modify the number of dishes and delete the dish items purchased. Moreover, the customer can select to continue to buy or confirm the order.

In the Android Application, the purchase flow is almost the same as that in the Website platform. The biggest difference is that in the Android Application, the customer must register a valid account to launch the application to do the further operations.

4 DATABASE AND GUI DESIGN

This chapter will describe database design and main graphical user interface design in this application.

4.2 Database Design

MySQL was chosen as a database, the table structures and attributes are the same as POJO classes mentioned in Model Structure shows above. The main entity and their relations will be described in detail next.

Table 1. Users Class Entity

<i>Key</i>	<i>Attribute</i>	<i>Comment</i>
PK	userId	User ID.
	userName	User Account Name.
	userPassword	User Account Password.

The Users entity contains information about the customer registered.

Table 2. OrderFoods Class Entity

<i>Key</i>	<i>Attribute</i>	<i>Comment</i>
PK	orderId	Order ID:
FK(Users)	userId	Customer ID.
	userName	Customer Real Name.
	address	Deliver Address.
	telephone	Customer contact number.
	email	Customer contact email.
	orderSuggest	Customer's requirement for dishes ordered.
	state	The state of order.
	createDate	Order created date.
	postal	Postal code of deliver address.

The OrderFoods entity is related to the customers who order dishes.

Table 3. Order Class Entity

<i>Key</i>	<i>Attribute</i>	<i>Comment</i>
PK	foodId	Dish ID.
PK/FK(Ord erFoods)	orderId	Order ID.
	quantity	The amount of dishes.

The entity in Table 3 responses for storing the relationship among order, dish items and dish amount.

Table 4. Employee Class Entity

<i>Key</i>	<i>Attribute</i>	<i>Comment</i>
PK	username	Employee login name.
	degree	Employee degree.
	email	Employee contact email.
	imageName	Employee photo name
	password	Employee login password.
	phone	Employee contact phone.
	realname	Employee real name.
	school	Employee graduate school.
	visible	The visible state of employee.
FK(IDCard)	card_id	The id of employee identity card.

The employee entity is used to store the information of employees in company. Employee can use their account saved here to log in the Background Management Platform.

Table 5. IDCard Class Entity

<i>Key</i>	<i>Attribute</i>	<i>Comment</i>
PK	id	The id of employee identify card.
	address	The address in ID card.
	birthday	The birthday in ID card.
	cardno	ID card number

The Employee and IDCard entity contains the detailed information of an employee. Because every employee has one unique IDCard, so the relationship between the Employee entity and the IDCard entity is one to one.

Table 6. ProductInfo Class Entity

<i>Key</i>	<i>Attribute</i>	<i>Comment</i>
PK	id	Dish ID.
	buyexplaine	The explainition of dish when customers buy.
	code	Dish code for administrator searching.
	createdate	The date for administrator add dish to system.
	description	Dish description.
	imagenname	Dish image name.
	marketprice	Dish market price.
	model	Dish model.
	name	Dish name.
	sellprice	Dish sale price.
	visible	The state of dish sale, on sale or sale stop.
FK(Product Type)	typeid	Category id the dishes belong to.

The entity in ProductInfo Class is used to save dish information which is displayed in Website Foreground Public Page and Android Application.

Table 7. ProductType Class Entity

<i>Key</i>	<i>Attribute</i>	<i>Comment</i>
PK	typeid	Category id the dishes belong to.
	name	Category name.
	note	Category note.

Website Public Page and Android Application provide function to display dishes according to different categories. The entity in Table 7 is used to store the dish categories.

Table 8. ProductStyle Class Entity

<i>Key</i>	<i>Attribute</i>	<i>Comment</i>
PK	id	Dish style id.
	imagename	Dish style image name.
	name	Dish style name.
FK(ProductInfo)	productid	The id of dish which style belongs to.

The entity in ProductInfo, ProductType and ProductStyle contains all information of the dishes. One category can has many dishes, so the relationship between ProductType and ProductInfo entity is one to many. One dish has only one style is designed in this project, so the relationship between ProductStyle and ProductInfo is one to one.

4.3 GUI Design

The user interface design was one of the core tasks in this project. The aim of UI design is to make the application to be accepted and used easily by users. The main UI will be shown next.

4.3.2 Background Management Platform

This section will describe the main GUI design in Background Management Platform

❖ Administrator Login page



Figure 22. Login page

The administrator need fill in a valid username and password to log in to the Background Management Platform. Here a validation function will check whether the username and password provided by the administrator are valid or invalid, if the username and password are valid, the administrator will log in successfully and enter the Background Management Main page, and otherwise a warning message will show.

❖ Background Management Main page

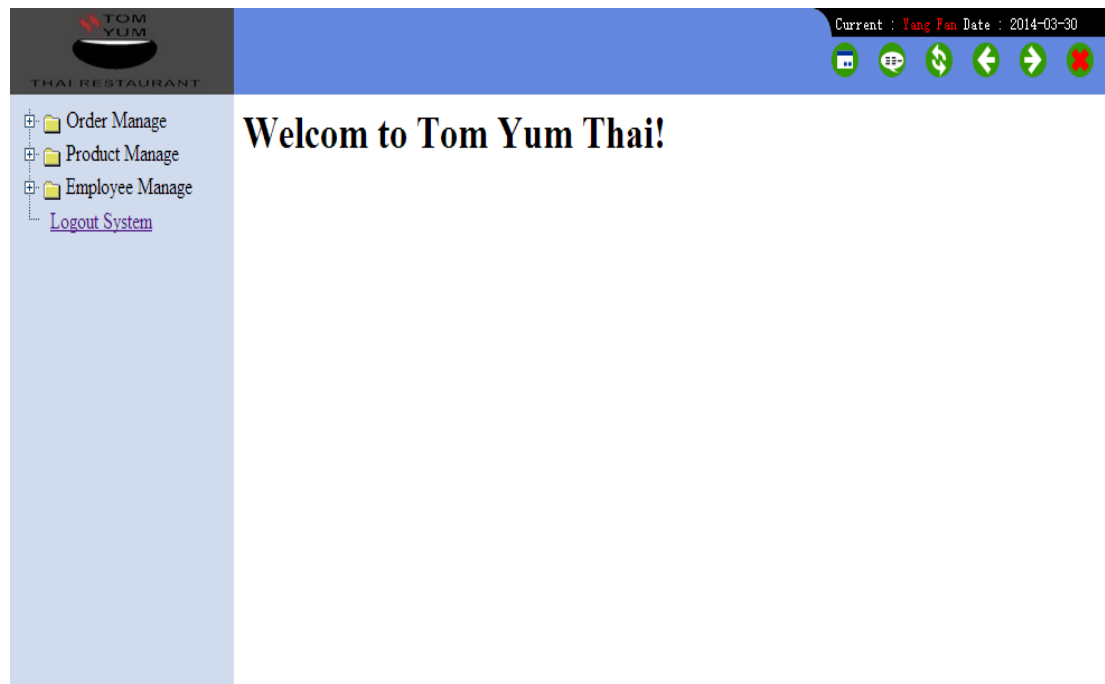


Figure 23. Management main page

After the administrator has logged in successfully, he will be allowed to enter the Background Management Main page. On this Main page, there are three main modules: Order Management, Product Management and Employee Management. The administrator can also log out of the system by clicking “Logout System“ link and ”red cross” button.

❖ Product Category List View page



Current : Yang Pan Date : 2014-03-30

Current Page:1 | Total Records:3 | 12 Records per Page | Total Page:1 Page 1

No.	Modify	Category Name	Note
3		Soup	Delicious!
2		Vegetarian	Delicious!
1		Meat	Delicious!

Add Category Query

Figure 24. Category List View Page

When Clicking “Category Manage” link, the existing categories will display on the left side.

❖ Category Adding page



Current : Yang Pan Date : 2014-03-30

Add Type:

Type Name: *

Note(100 limit):

Confirm

Figure 25. Category Adding page

The administrator can add a new category on the Category adding page. All data needed here are Type Name and Note.

❖ Product Information List View page

Product ID	Product Code	Modify	Product Name	Category Belong	Sell Price		
<input type="checkbox"/> 6	S200		Bean Curd Soap	Soup	8.0	On Sale	Product Image Manage
<input type="checkbox"/> 5	S100		Tomato and Egg Soap	Soup	8.0	On Sale	Product Image Manage
<input type="checkbox"/> 4	V200		Sour and Hot cabbage	Vegetarian	5.0	On Sale	Product Image Manage
<input type="checkbox"/> 3	V100		Sour and Hot Potato	Vegetarian	5.0	On Sale	Product Image Manage
<input type="checkbox"/> 2	M200		Chilli Beef	Meat	14.0	On Sale	Product Image Manage
<input type="checkbox"/> 1	M100		Chilli Chicken	Meat	11.0	On Sale	Product Image Manage

☐ All Select

Figure 26. Product List View page

To click “Product Manage“ link, the existing food information will be shown on the left side.

❖ Product Adding page

Add Product:

Product Name:

Product Type*: [\(Add Product Type\)](#)

Market Price: € *

Sell Price: € *

Product Code: (Note: In order to search product)

Product Image: Style Name: Style Image: No file chosen

Model:

Purchase Description:

Product Description. * :

Figure 27. Add Product page

By clicking “add” button on the Product Information List View page, the administrator can go into Product Adding page and add new product information here.

❖ Product Style page



Figure 28. Product Style page

On the Product Style page, the administrator can view and change food image.

❖ Order List View page

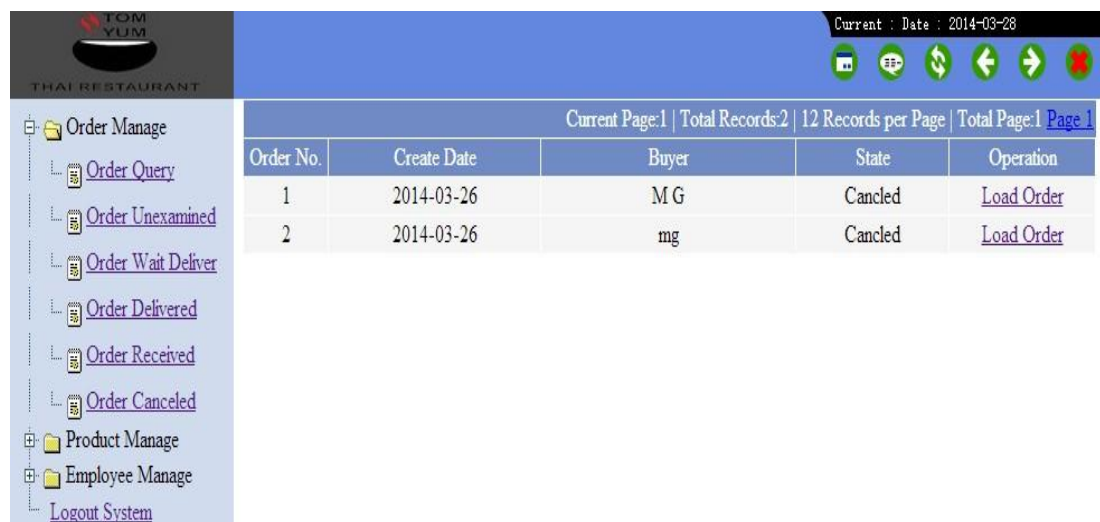


Figure 29. Order List View page

In the Order Management module, there are orders with different states. For example, when the administrator clicks “Order Unchecked“, the orders with “unchecked“ state will be shown on the left side.

❖ Order Detail Display page

TOM YUM THAI RESTAURANT

Current : Date : 2014-03-26

Order No.1 (Canceled) Order Time:2014-03-26

Name	M G	Telephone	0407748925	Email	mg@puv.fi
Address	Vamk	Postal	6520		
Request	little chilli!				
Products Ordered					
Product Code	Product Name			Unit Price	Amount
M100	Chilli Chicken			€11.0	2
V200	Sour and Hot cabbage			€5.0	2
S100	Tomato and Egg Soap			€8.0	1
					Payable Fee:€40.0

Order Manage

- Order Query
- Order Unexamined
- Order Wait Deliver
- Order Delivered
- Order Received
- Order Canceled
- Product Manage
- Employee Manage
- Logout System

Figure 30. Order Detail Display View page

By clicking “Load Order“ link in Order List View page, the selected order will show its detailed information.

4.2.2 Website Foreground Public Page

❖ Dishes Display page

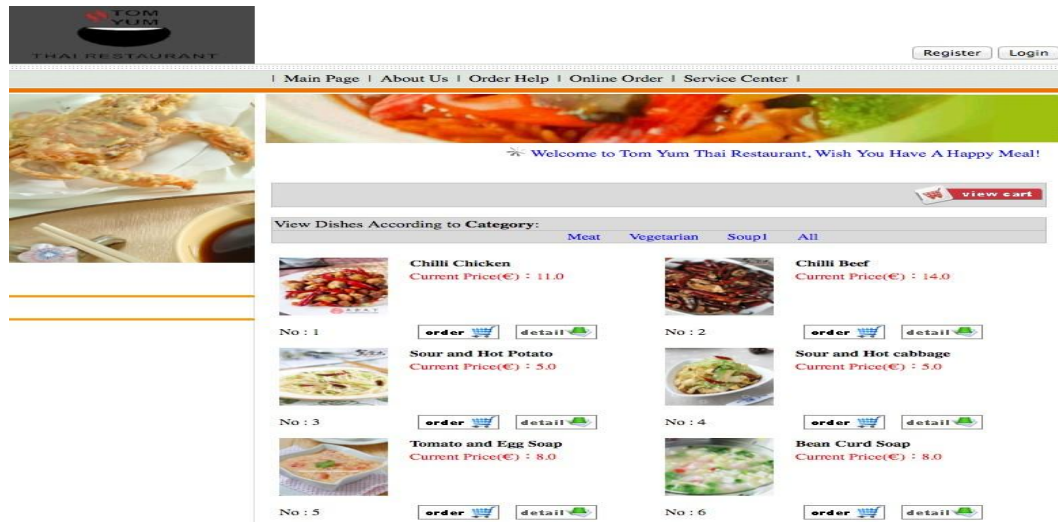


Figure 31. Dishes Display page

The food information, such as image, name and price and so on is shown on the Dishes Display page.

❖ Customer Login page

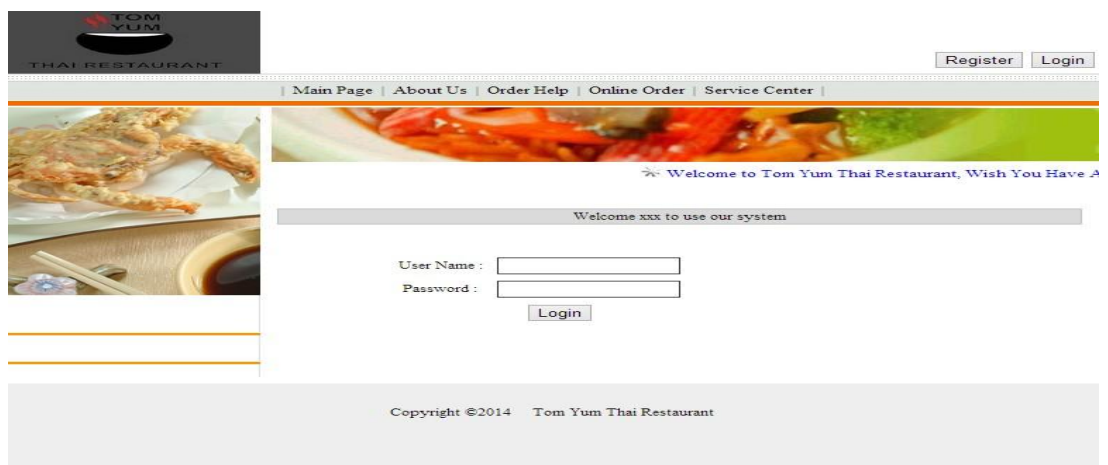


Figure 32. Customer Login page

On the Customer Login page, the customer needs customer to fill in a valid username and password to log into the application.

❖ Shopping Cart page

The Products You Purchased As Follow :

No.	Product Name	Unit Price(€)	Amount	
2	Chilli Beef	14.0	<input type="text" value="2"/>	Delete
1	Chilli Chicken	11.0	<input type="text" value="1"/>	Delete
6	Bean Curd Soap	8.0	<input type="text" value="5"/>	Delete
			Update	Total Price(€): 79.0

Clear Cart	Continue to Buy	Produce Order
----------------------------	---------------------------------	-------------------------------

Figure 33. Shopping Cart page

The dishes ordered by the customer will be added into the Shopping Cart temporarily. The customer can delete dish items, modify dish amount and make other related operations here.

4.2.3 Android Application

❖ Launch Window

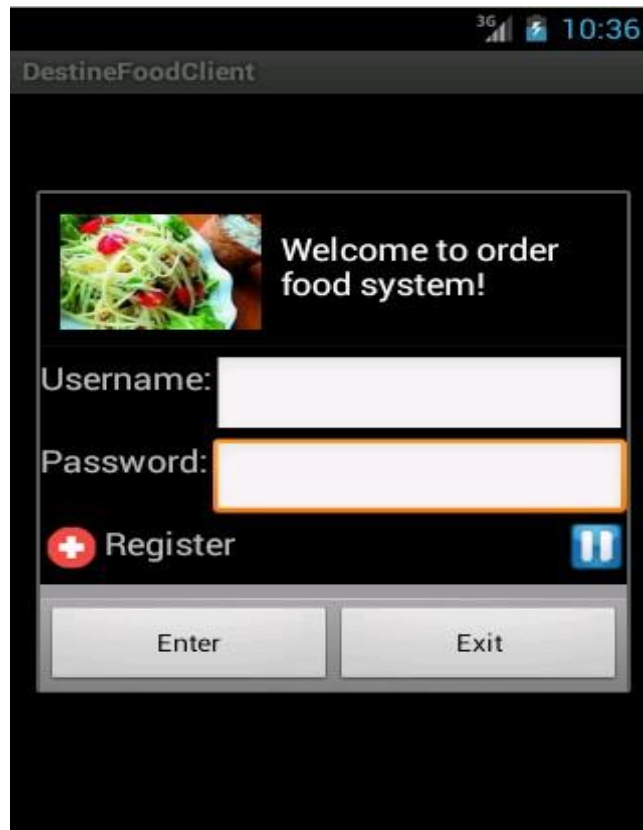


Figure 34. Launch Window

The customer needs a valid username and password to use the Android food ordering application.

❖ Register Window

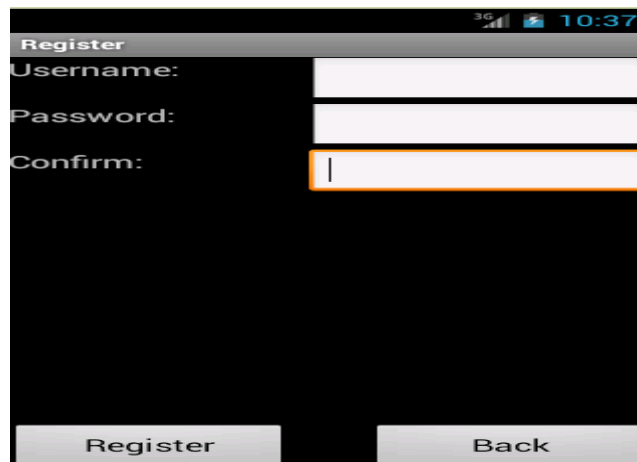
A screenshot of a mobile application's 'Register' window. The window has a black background with white text. At the top, the title 'Register' is displayed. Below it, there are three input fields: 'Username:', 'Password:', and 'Confirm:'. The 'Confirm:' field is currently active, indicated by a cursor. At the bottom of the window, there are two buttons: 'Register' and 'Back'. The status bar at the top shows '3G' signal, a battery icon, and the time '10:37'.

Figure 35. Register Window

If the customer has no account, he can go to the Register Window to register an account.

❖ Dishes Display Main Window

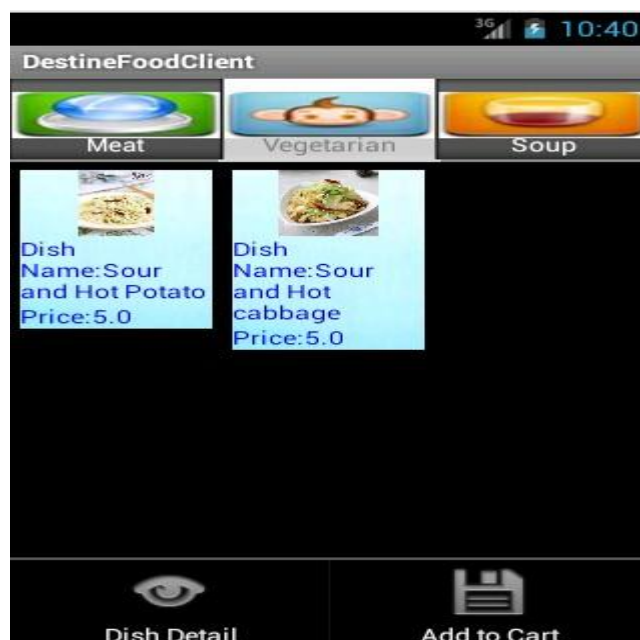


Figure 36. Dishes Display Main Window

The customer can view dishes information according to different food categories.

❖ Dish Detail Information Window

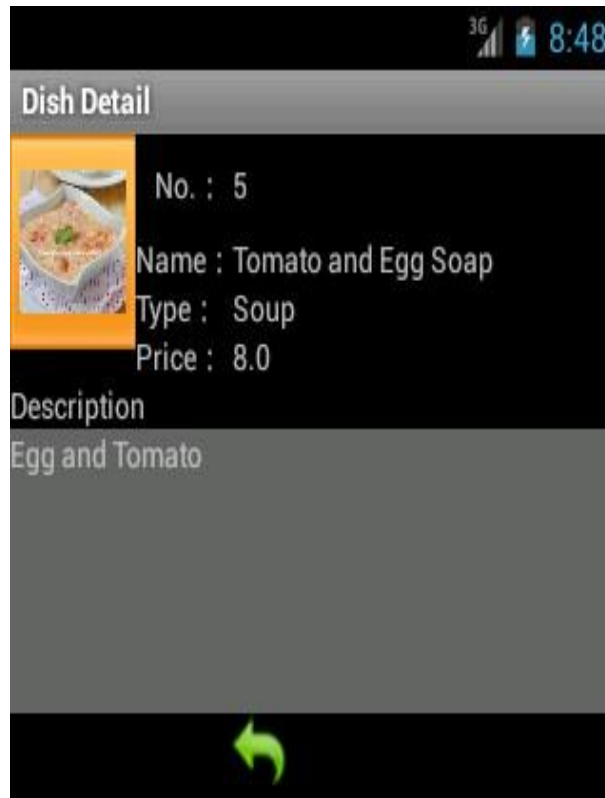
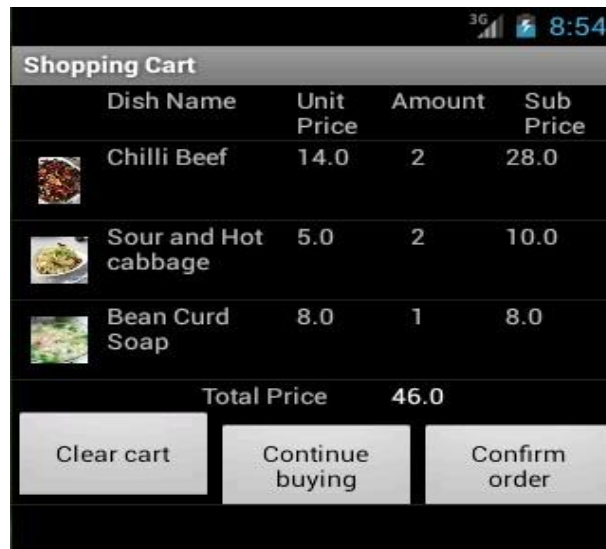


Figure 37. Dish Detail Information Window

The customer can view dish detailed information by touching “Dish Detail” button in the Dishes Display Main Window.

❖ Shopping Cart Window

A screenshot of a mobile application's Shopping Cart window. The window has a title bar with the text "Shopping Cart" and a status bar at the top showing "3G", signal strength, battery, and time "8:54". The main content is a table with four columns: "Dish Name", "Unit Price", "Amount", and "Sub Price". There are three rows of items: "Chilli Beef" with a unit price of 14.0 and amount of 2, "Sour and Hot cabbage" with a unit price of 5.0 and amount of 2, and "Bean Curd Soap" with a unit price of 8.0 and amount of 1. Below the table, the "Total Price" is displayed as 46.0. At the bottom, there are three buttons: "Clear cart", "Continue buying", and "Confirm order".

Dish Name	Unit Price	Amount	Sub Price
Chilli Beef	14.0	2	28.0
Sour and Hot cabbage	5.0	2	10.0
Bean Curd Soap	8.0	1	8.0
Total Price		46.0	

Figure 38. Shopping Cart Window

The dishes ordered by the customer will be stored in the Shopping Cart in **Figure 38**.

❖ Dish Modify Window

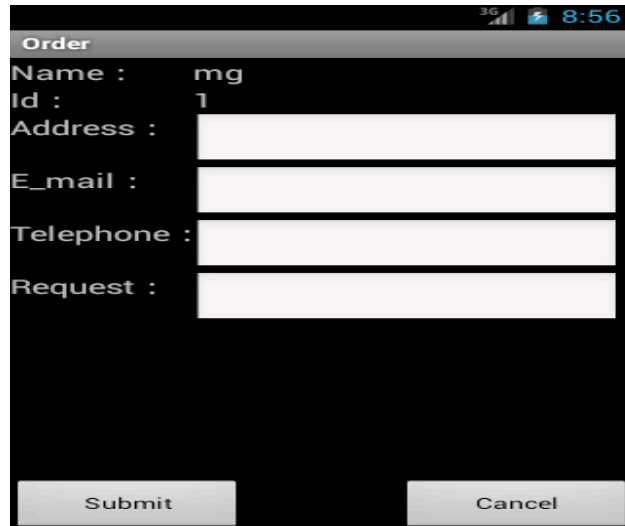
A screenshot of a mobile application's Dish Modify window. The window has a title bar with the text "Shopping Cart" and a status bar at the top showing "3G", signal strength, battery, and time "8:56". The main content is a form titled "modify amount or delete item". It features a large image of a bowl of soup. Below the image, there is a label "Amount" and a text input field containing the number "1". At the bottom, there are three buttons: "Update", "Delete", and "Cancel".

Dish Name	Unit	Amount	Sub
modify amount or delete item			
			
Amount		1	

Figure 39. Dish Modify Window

To touch some dish item, a pop-up window will show. In this window, the customer can modify the number of dishes or delete this dish item.

❖ Order Confirmation Window



The image shows a screenshot of a mobile application's 'Order' confirmation window. The window has a title bar labeled 'Order' and a status bar at the top displaying '3G', signal strength, and the time '8:56'. The form contains the following fields:

- Name : mg
- Id : 1
- Address : [text input field]
- E_mail : [text input field]
- Telephone : [text input field]
- Request : [text input field]

At the bottom of the window, there are two buttons: 'Submit' and 'Cancel'.

Figure 40. Order Confirmation Window

Finally, the customer needs to provide correct delivery and contact information.

5 IMPLEMENTATION

The implementation of core functions is described in this chapter.

5.2 Adding Food in Background Management Platform

Adding Food is a core function in the Background Management Platform. The food information added here will be displayed on the Website Public Page and Android Application to the customer. The brief implementation code of this method is shown below.

```
<action name="add_product" class="productform" method="add">
  <interceptor-ref name="fileUpload">
    // image formate allowed to be uploaded
    <param
name="allowedTypes">image/bmp,image/png,image/gif,image/jpeg,image/jpg</param>
    //image maximum size
    <param name="maximumSize">1025956</param>
  </interceptor-ref>
  <interceptor-ref name="defaultStack"/>
  <result name="message">/WEB-INF/page/share/message.jsp</result>
  <result name="input">/WEB-INF/page/share/img_error.jsp</result>
</action>
```

Snippet 1. Action configuration in struts.xml

When "add_product" action is executed, it will call "add" method in productform class. Meanwhile, the size and image format are restricted. Once, this "add" method runs successfully, this action will return to message.jsp page, otherwise, action will return to img_error.jsp page.

```
public String add(){
    ProductInfo product = new ProductInfo();
    product.setName(name);
    product.setSellprice(sellprice);
    product.setMarketprice(marketprice);
    product.setBuyexplain(buyexplain);
    product.setCode(code);
    product.setDescription(description);
    product.setModel(model);
    product.setProducttype(new ProductType(typeid));
    product.setImagename(imagefileFileName);
    //construct image name
    String ext = imagefileFileName.substring(imagefileFileName.lastIndexOf("."));
    String imagename = UUID.randomUUID().toString() + ext;
    product.setImagename(imagename);
    product.addProductStyle(new ProductStyle(stylename, imagename));
}
```

```

productInfoService.save(product);
String pathdir = "/images/product";//create file store path
// file store real path
String realpathdir = ServletActionContext.getServletContext().getRealPath(pathdir);
if(imagefile!=null){
    File savedir = new File(realpathdir);
    if(!savedir.getParentFile().exists())
        savedir.mkdirs();
    String path = pathdir + "/" + imagename;
    File savefile = new File(savedir,imagename);
    try {
        FileUtils.copyFile(imagefile, savefile);
    } catch (IOException e) {
        e.printStackTrace();
    }
    System.out.println(path);
    System.out.println(realpathdir+"/"+imagename);
}
ActionContext actionContext = ActionContext.getContext();
Map<String,Object> request = (Map) actionContext.get("request");
request.put("message", "Add product successfully!");
request.put("urladdress", SiteUrl.readUrl("control.product.list"));

return "message";
}

```

Snippet 2. The adding food method

Using this method, the food information will be inserted into MySql database. Meanwhile, the image will be stored into the Tomcat server.

5.3 Display Food Information in Website Public Page

The food information added in the Background Management Platform needs to be displayed on the Website Public Page. This implementation code is described here.

```

<servlet>
    <servlet-name>DisplayFoodServlet</servlet-name>
    <servlet-class>com.yangfan.servlet.web.DisplayFoodServlet</servlet-class>
</servlet>
<servlet-mapping>
    <servlet-name>DisplayFoodServlet</servlet-name>
    <url-pattern>/DisplayFoodServlet</url-pattern>
</servlet-mapping>
</servlet>

```

Snippet 3. Servlet configuration in web.xml

When the customer visits the url address like .../DisplayFoodServlet through browser, the methods in DisplayFoodServlet will be executed as follows.

```
public class DisplayFoodServlet extends HttpServlet{
    @Override
    protected void doGet(HttpServletRequest request, HttpServletResponse response)
        throws ServletException, IOException {
        doPost(request, response);
    }

    @Override
    protected void doPost(HttpServletRequest request, HttpServletResponse response)
        throws ServletException, IOException {
        FoodDao dao = new FoodDaoImpl();
        List<Foods> foods = new ArrayList<Foods>();
        String typeid = request.getParameter("typeid");
        //Display dishes according to different categories
        if(typeid != null){
            if("all".equals(typeid)){
                foods = dao.getAllFood2();
            } else {
                foods = dao.getAllFood2ById(Integer.parseInt(typeid));
            }
        } else {
            foods = dao.getAllFood2();
        }
        List<FoodsType> types = dao.getAllFoodsType();
        request.setAttribute("foodsTypes", types);
        //System.out.println(foods);
        request.setAttribute("foods", foods);
        request.getRequestDispatcher("show.jsp").forward(request, response);
    }
}
```

Snippet 4. Display Food Servlet View

When doPost method is called, it will check what parameter is taken by the request. If the parameter is “all“, all the food information will be displayed on the Website Public Page, if the parameter is other, the food information belongs to this category will be shown.

5.4 Order Food in Website Public Page

The food ordered by customers will be stored into the shopping cart temporarily. The shopping cart is achieved with session and cookie.

```
protected void doPost(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, IOException {
    String foodId = request.getParameter("foodId");
```

```

ShopCart buyCart = (ShopCart) request.getSession().getAttribute("buycart");
//Create shopping cart, cookie id is not null. Shopping cart shared within different
browsers
if(buyCart == null){
    String sid = WebUtil.getCookieByName(request, "buyCardID");
    //session id is not null
    if(sid != null){
        HttpSession session = SiteSessionListener.getSession(sid);
        if(session != null)
            buyCart = (ShopCart) session.getAttribute("buycart");
        if(buyCart == null){
            SiteSessionListener.removeSession(sid);
            request.getSession().setAttribute("buycart", buyCart);
            WebUtil.addCookie(response, "buyCardID",
            request.getSession().getId(),
            request.getSession().getMaxInactiveInterval());
        }
    }
}
//Create shopping cart
if(buyCart == null){
    buyCart = new ShopCart();
    request.getSession().setAttribute("buycart", buyCart);
    WebUtil.addCookie(response, "buyCardID", request.getSession().getId(),
    request.getSession().getMaxInactiveInterval());
}
//put food into shopping cart
if(foodId != null){
    FoodDao dao = new FoodDaoImpl();
    Foods food = dao.getFoodById(Integer.parseInt(foodId));
    ShopCart cart = new ShopCart();
    cart.setFoodId(food.getFoodId());
    cart.setFoodName(food.getFoodName());
    cart.setFoodPrice(food.getFoodPrice());
    //cart.setFoodNum(Integer.parseInt(amount.trim()));
    buyCart.addItem(cart);
}
request.setAttribute("buyCart", buyCart);
request.getRequestDispatcher("shopCart.jsp").forward(request, response);
}

```

Snippet 5. Shopping Cart View

The food purchased by customers will be added to the shopping cart. If there is no shopping cart in the session, a new shopping cart with name "buycart" will be created in the session. Meanwhile the "buyCardID" of this shopping cart will be added into the cookie to response to the customer's browser and the customer's browser will store the cookie with "buyCardID". When the customer opens a new browser, the server will receive the request with the cookie. The cookie is used here to solve the problem that the shopping cart is shared within several browsers,

it will make sure that the previous shopping cart will not be lost when the customer opens a new browser.

5.5 Display Food Information in Android Application

Step 1. Create connection between Android and website

```
public final static StringBuffer getConnectionPost(String url,
    HashMap<String, String> params) {
    StringBuffer sb = new StringBuffer();
    HttpPost request = null;
    HttpResponse response = null;
    try {
        if (url != null) {
            request = new HttpPost(url);
            List<NameValuePair> list = new ArrayList<NameValuePair>();
            for (Map.Entry<String, String> entry : params.entrySet()) {
                String name = entry.getKey();
                String value = entry.getValue();
                list.add(new BasicNameValuePair(name, value));
            }
            //packaging request data
            request.setEntity(new UrlEncodedFormEntity(list, HTTP.UTF_8));
            response = new DefaultHttpClient().execute(request);
            //make connection successfully
            if (response.getStatusLine().getStatusCode() == 200) {
                String temp = EntityUtils.toString(response.getEntity());
                if (temp.trim().length() > 0) {
                    sb.append(temp);
                } else {
                    sb.append("error response data length");
                }
            } else {
                sb.append("error response code:").append(
                    response.getStatusLine().getStatusCode());
            }
        } else {
            return null;
        }
    } catch (Exception e) {
        e.printStackTrace();
    }
    return sb;
}
```

Snippet 6. Connection Method View

Because the information shown in the Android application comes from the website, the first step is to make the connection between the Android application

and the website. The method in Snippet 6 illustrates how to make connection and how to format the request data and response data.

Step 2. Decode response data from website

```
public final static ArrayList<Food> decodeResponseData(String sb) {

    ArrayList<Food> resData = new ArrayList<Food>();
    String itemStr = "";
    String name = "";
    String value = "";
    Food food;
    //split response data
    do {
        int a = sb.indexOf(',');
        if (a == -1) {
            itemStr = sb;
            food = new Food();
            while (true) {
                int n_last = itemStr.indexOf('=');
                name = itemStr.substring(1, n_last);
                System.out.println(name);
                int v_first = itemStr.indexOf('=');
                itemStr = itemStr.substring(v_first);
                int v_last = itemStr.indexOf(';');
                if (v_last == -1) {
                    v_last = itemStr.indexOf(']');
                }
                value = itemStr.substring(1, v_last);
                System.out.println(value);
                //decode values of properties
                if (name.equals("foodId") && name != null) {
                    food.foodId = Integer.parseInt(value);
                } else if (name.equals("foodPrice") && name != null) {
                    food.foodPrice = Float.parseFloat(value);
                } else if (name.equals("foodType") && name != null) {
                    food.foodType = Integer.parseInt(value);
                } else if (name.equals("foodDescri") && name != null) {
                    food.foodDescri = value;
                } else if (name.equals("foodImage") && name != null) {
                    food.foodImage = value;
                } else if (name.equals("foodName") && name != null) {
                    food.foodName = value;
                } else {
                    Log.e(" ---- ", "error params");
                }
                itemStr = itemStr.substring(v_last);
                if (itemStr.trim().startsWith("]")
                    || itemStr.trim().length() <= 2) {
                    break;
                }
            }
            // end of while
            resData.add(food);
            break;
        }
    }
```

```

itemStr = sb.substring(0, a );
food = new Food();
while (true) {
    int n_last = itemStr.indexOf('=');
    name = itemStr.substring(1, n_last);
    System.out.println(name);
    int v_first = itemStr.indexOf('=');
    itemStr = itemStr.substring(v_first);
    int v_last = itemStr.indexOf(';');
    if (v_last == -1) {
        v_last = itemStr.indexOf(']');
    }
    value = itemStr.substring(1, v_last);
    System.out.println(value);
    Log.e("name" + name, "value" + value);
    if (name.equals("foodId") && name != null) {
        food.foodId = Integer.parseInt(value);
    } else if (name.trim().equals("foodPrice") && name != null) {
        Log.e("GetNet test", "---" + name);
        food.foodPrice = Float.parseFloat(value);
    } else if (name.equals("foodType") && name != null) {
        Log.e("GetNet test", "---" + value);
        food.foodType = Integer.parseInt(value);
    } else if (name.equals("foodDescri") && name != null) {
        food.foodDescri = value;
    } else if (name.equals("foodImage") && name != null) {
        food.foodImage = value;
    } else if (name.equals("foodName") && name != null) {
        Log.e("GetNet test", "---" + value);
        food.foodName = value;
    } else {
        Log.e("---- ", "error params");
    }
    itemStr = itemStr.substring(v_last);
    if (itemStr.trim().startsWith("]")
        || itemStr.trim().length() <= 2) {
        break;
    }
} // end of while
resData.add(food);
sb = sb.substring(a + 1);
} while (true);
return resData;
}

```

Snippet 7. Decode response data from website

The Android application sends the request to the website, the website will response food information to the Android application. Because the format of response data is a List, the method in Snippet 7 describes how to decode the response data.

Step 3. Display Food Information Data in Android


```

<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:id="@+id/widget39"
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:background="@drawable/bluebackground"
    android:orientation="vertical" >
    <ImageView
        android:id="@+id/zg_gridicon"
        android:layout_width="wrap_content"
        android:layout_height="50dp" />
    <TextView
        android:id="@+id/zg_gridname"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Name"
        android:textColor="#ff0000ff" />
    <TextView
        android:id="@+id/zg_gridprice"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Dish Price"
        android:textColor="#ff0000ff" >
    </TextView>
</LinearLayout>

```

Snippet 8. Food Display Layout file

In the layout file, name, price and image properties are provided. The related response data value will be given to these properties. It means the customer can view the information of food, such as food name, food price and food price in android food display window.

5.6 Order Food In Android Application

In the Android Application, the shopping cart is achieved with Android's own database – SQLiteDatabase.

```

public long addFood(ShopCart food) {
    try {
        Cursor cur = sqllite.query(TABLE_SHOP_CART, COLS, null, null, null, null,
null);
        cur.moveToFirst();
        int foodId;
        int count = cur.getCount();
        //add food which exists in shopping cart, only update amount
        for (int i = 0; i < count; i++) {
            foodId=cur.getInt(0);
            if(food.getFoodId()==foodId){
                ContentValues value = new ContentValues();

```

```

        value.put("foodnum", food.getFoodNum()+cur.getInt(3));
        value.put("foodsumprices", food.getSumPrices()+cur.getFloat(4));
        return sqllite.update(TABLE_SHOP_CART, value,
            "foodid="+foodId, null);
    }
    cur.moveToNext();
}
} catch (Exception e) {
    e.printStackTrace();
}
//add new food
ContentValues value = new ContentValues();
value.put("foodid", food.getFoodId());
value.put("foodname", food.getFoodName());
value.put("foodprice", food.getFoodPrice());
value.put("foodnum", food.getFoodNum());
value.put("foodsumprices", food.getSumPrices());
value.put("foodimage", food.getImageName());
return sqllite.insert(TABLE_SHOP_CART, null, value);
}

```

Snippet 9. Add Food Information into SQLiteDatabase

When the customer purchases a food item, the information of the food item will be stored into SQLiteDatabase.

```

private void callPost(Object[][] foods, String address,
    String email, String telephone, String suggest,
    String userId, String userName) {
    //request address
    HttpPost req = new HttpPost(
        com.yangfan.util.URL.url+"AddOrderServlet");
    List<NameValuePair> param = new ArrayList<NameValuePair>();
    //packaging customer deliver information
    param.add(new BasicNameValuePair("userName", userName));
    param.add(new BasicNameValuePair("userId", userId));
    param.add(new BasicNameValuePair("address", address));
    param.add(new BasicNameValuePair("email", email));
    param.add(new BasicNameValuePair("telephone", telephone));
    param.add(new BasicNameValuePair("suggest", suggest));
    param.add(new BasicNameValuePair("foodsNum", orderFoods.size()
        + ""));
    //packaging dish ordering information
    for (int i = 0; i < orderFoods.size(); i++) {
        param.add(new BasicNameValuePair("foodId" + i, orderFoods
            .get(i).getFoodId() + ""));
        param.add(new BasicNameValuePair("foodName" + i, orderFoods
            .get(i).getFoodName()));
        param.add(new BasicNameValuePair("foodNum" + i, orderFoods
            .get(i).getFoodNum() + ""));
        param.add(new BasicNameValuePair("foodPrice" + i,
            orderFoods.get(i).getFoodPrice() + ""));
        param.add(new BasicNameValuePair("sumPrices" + i,
            orderFoods.get(i).getSumPrices() + ""));
    }
}

```

```

    }
    try {
        //send request
        req.setEntity(new UriEncodedFormEntity(param, HTTP.UTF_8));
        try {
            HttpResponse res = new DefaultHttpClient().execute(req);
            if (res.getStatusLine().getStatusCode() == 200) {
                showDialog(1);
            }
        } catch (ClientProtocolException e) {
            e.printStackTrace();
        } catch (IOException e) {
            e.printStackTrace();
        }
    } catch (UnsupportedEncodingException e) {
        e.printStackTrace();
    }
}
});

```

Snippet 10. Add shopping cart and deliver information to request parameter

Using this method, the information of purchased food and customer delivery information will be added into the request parameter. Android sends a request to the website servlet shown below.

```

public class AddOrderServlet extends HttpServlet {
    public void doGet(HttpServletRequest request, HttpServletResponse response)
        throws ServletException, IOException {

        response.setContentType("text/html");
        PrintWriter out = response.getWriter();
        int userId = Integer.parseInt(request.getParameter("userId"));
        String userName = request.getParameter("userName");
        String address = request.getParameter("address");
        String email = request.getParameter("email");
        String telephone = request.getParameter("telephone");
        String suggest = request.getParameter("suggest");
        OrderFoods orderfoods = new OrderFoods();
        orderfoods.setUserId(userId);
        orderfoods.setUserName(userName);
        orderfoods.setAddress(address);
        orderfoods.setEmail(email);
        orderfoods.setTelephone(telephone);
        orderfoods.setOrderSuggest(suggest);
        orderfoods.setCreateDate(new Date());
        orderfoods.setState(OrderState.WAITCONFIRM);
        FoodDao dao = new FoodDaoImpl();
        int orderId = dao.addOrder(orderfoods);
        int foodsNum = Integer.parseInt( request.getParameter("foodsNum"));
        ArrayList<ShopCart> list = new ArrayList<ShopCart>();
        //Add food to shopping cart
        for(int i=0;i<foodsNum;i++){
            ShopCart cart = new ShopCart();

```

```

        int foodId = Integer.parseInt(request.getParameter("foodId"+i));
        int foodNum= Integer.parseInt(request.getParameter("foodNum"+i));
        cart.setFoodId(foodId);
        cart.setFoodName(request.getParameter("foodName"+i));
        cart.setFoodNum(foodNum);
        cart.setFoodPrice(Float.parseFloat(request.getParameter("foodPrice"+i)));
        cart.setSumPrices(Float.parseFloat(request.getParameter("sumPrices"+i)));
        list.add(cart);
        boolean success = dao.addCartInformation(orderId, foodId, foodNum);/
    }

    ArrayList dingdan = new ArrayList();
    dingdan = dao.findOrderByOrderId(orderId);
    StringBuffer sb = new StringBuffer();
    int j=1;
    for(int i=0;i<dingdan.size();i+=3){
        System.out.println(dingdan.get(i)+" "+dingdan.get(i+1)+"
        "+dingdan.get(i+2));
    }
    out.flush();
    out.close();
}

public void doPost(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, IOException {
    doGet(request, response);
}

}

```

Snippet 11. AddOrderServlet View

Android sends a request to AddOrderServlet on the website, the doGet method in this servlet will be called. Through this method, the ordered food information and customer information in the request parameter will be inserted into MySQL database.

These are the core functions of Mobile Food Ordering Application.

6 TESTING

The project has been deployed on the Tomcat server. All objectives of the application were tested. The testing of the main features are described as the following testing table:

Table 9. The application-testing table part 1

<i>Test Case</i>	<i>Description</i>	<i>Predictions</i>	<i>Result</i>
V-1-01	Admin Login	1. Fill in username and password 2. The system validates whether user account is valid.	OK
V-1-02	Adding Dish Category	1. Click “Add Category” button 2. Fill in required data	OK
V-1-03	Modifying Dish Category	1. Click “Modify” button 2. Modify category data	OK
V-1-04	Querying Dish Category	1. Click “Query” button 2. Fill in category name	OK
V-1-05	Adding Dish	1. Click “Add” button 2. Fill in all data needed	OK
V-1-06	Modifying Dish	1. Click “Modify” button 2. Modify Dish data	OK
V-1-07	Querying Dish	1. Click “Query” button 2. Fill in query condition data.	OK
V-1-08	Stop Sale or Star Sale dish	1. Select some dish item or all dish items using checkbox. 2. Click “Stop Sale” button or “On Sale” button.	OK

V-1-09	Change Dish Image	1. Click “Product Image Manage” link 2. Click “Modify” button, change image	OK
V-1-10	Adding Employee	1. Click “Add Employee” button 2. Fill in related data in fields	OK
V-1-11	Modifying Employee	1. Click “Modify” button 2. Modify employee data	OK
V-1-12	Marking Leave	Click “Mark Leave” button	OK
V-1-13	Querying Employee	1. Click “Query” button 2. Fill in query condition data	OK
V-1-14	Loading Order	Click “Load Order” link	OK
V-1-15	Changing Order State	Click “Cancel Order” button, “Order Examined” button, “Delivered” button, “Delivered” button according to request in different order detail view page.	OK

Table 9 indicates that the core functions for the administrator in the Background Management Platform had been successfully achieved, and the following Table 10 describes the test results of main functions for the customer on the Website Public Page.

Table 10. The application-testing table part 2

V-2-01	View different categories dishes	Click different categories links	OK
V-2-02	View Dish Detail	Click “Detail” button	OK
V-2-03	Order Dish	Click “Purchase” button	OK
V-2-04	Register	1. Click “Register” button 2. Fill in required data	OK
V-2-05	Login	1. Click “Login” button 2. Fill in data needed	OK
V-2-06	Updating Dish Amount	1. Modify dish amount 2. Click “Update” button	OK
V-2-07	Delete some dish item	Click “Delete” button	OK
V-2-08	Clear Shopping Cart	Click “Clear Cart” button	OK
V-2-09	Continue to Buy	1. Click “Continue” button, jump to dishes displaying page 2. Continue shopping	OK
V-2-10	Produce Order	Click “Produce Order” button to finish shopping.	OK

Table 11 describes the test results of main functions for the customer in the Android Application.

Table 11. The application-testing table part 3

V-3-01	Register	1. Click “Register” button in launcher window 2. Fill in data needed	OK
V-3-02	Login	Fill in data in related field	OK
V-3-03	View Dishes according to dish categories	Click Tab View button responding to category	OK
V-4-04	View Detail Information of dish	1. Click some dish item 2. Click “View” optional button	OK
V-4-05	Purchase Dish	1. Click some dish item 2. Click “Purchase” optional button 3. Fill in dish amount	OK
V-4-06	Modify or Delete some dish item	1. Click some dish item in shopping cart 2. Click “Delete” button 3. Modify dish amount, click “Update” button	OK
V-4-07	Clear Shopping Cart	Click “Clear” button	OK
V-4-08	Continue to Buy	Click “Continue” button, jump to dishes display window	OK
V-4-09	Produce Order	1. Click “Confirm” button in shopping cart 2. Fill in customer deliver information and Click “confirm“.	OK

7 CONCLUSIONS

This project contains three parts, Background Management Platform, Website Public Page and Android Application. The Background Management Platform was implemented with Struts2, Spring and JPA framework. Website Public Page was achieved with Servlet/JSP and JavaBean. The Android framework was used in the Android Application.

This project was a typical combination between a website and an Android application. The aim of the project was to help the restaurant owner to improve the efficiency of managing, meanwhile, help the customer to purchase dishes in different platforms easily.

By now, the core function of this project has been implemented. The owner and employees in the company can manage dishes and handle dish orders and so on. On the public page, customers can view dish information and purchase dishes. Also, the customer can order dishes from the Android platform.

Developing the application made it possible to learn and practice the whole processes of agile development with S2SJ frameworks as well as Android framework.

Main Challenges in Developing:

- Struts2, Spring, JPA frameworks Integration

The Background Management Platform was achieved with Struts2 framework, Spring framework and JPA framework, the first challenge was how to integrate these three frameworks. For this task, the framework version, jar packages and configuration files needed to be considered and selected. Via checking related books and videos, the challenge was overcome.

- Android Network Programming

Because the project was a combination between a website and an Android application, the second challenge was how to transfer data between the website

and the Android application. In order to overcome this challenge, the knowledge about the Android Network Programming was learned alone by means of different ways.

- Debugging

HTTP 404 and 500 errors appeared frequently during the project testing. Some errors often needed to be solved for a long time. Although the errors were a nuisance, it helped the programmers to improve their debugging ability and accumulate development experience.

Future Work:

- Internationalization

In the future, the system will support internationalization. At least, Finnish, Chinese and English language environment will be provided, customers that come from different countries can order dishes in their own language.

- Permission Management in Background Management Platform

The Permission Management will need to be developed in the future. Although the owner and the employees can log in to the Background Management Platform and make related operations, the owner should have a higher permission than the employees. It means that some operation only can be done by the owner, the employees have no privilege to do, for instance, adding an employee account, modifying employee information and marking employee leave.

- Query Dish Function in Website Foreground Public Page

On the Website Foreground Public Page, a Query Dish Function should to be provided. With the number of dishes increasing, customers can search some dish and view related information quickly by using this function.

- System Extension

Thanks to my friend's idea, the system can be extended to a huge food-ordering platform. This platform is used to display the dishes of several restaurants, not only one. The restaurants can manage their own dish information in the Background Management Platform. And customers can view the dish information of different restaurants and select the restaurant they like.

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