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| Capstone Project Document |

**Carrier Trading Center**

Report #3 – Software Design Document

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**- Hanoi, 04/2017-**

# Table of Contents

Table of Contents

[Table of Contents 1](#_Toc479719700)

[2 Introduction 3](#_Toc479719701)

[2.1 Purpose 3](#_Toc479719702)

[2.2 Definitions and Acronyms 3](#_Toc479719703)

[3 Design Oveview 3](#_Toc479719704)

[4 System Architecture Design 4](#_Toc479719705)

[4.1 Choice of System Architecture 4](#_Toc479719706)

[4.1.1 MVC Model Overview 4](#_Toc479719707)

[4.1.2 JSF Framework 5](#_Toc479719708)

[4.1.3 JSF and MVC 5](#_Toc479719709)

[4.1.4 Why JSF? 5](#_Toc479719710)

[4.1.5 Managed Bean, Backing Bean, View Object, and Domain Object Model 6](#_Toc479719711)

[4.2 Discussion of Alternative Designs 7](#_Toc479719712)

[4.3 Description of System Interface 7](#_Toc479719713)

[5 Detailed Design of System 7](#_Toc479719714)

[5.1 Guest 7](#_Toc479719715)

[5.1.1 Guest register a new account 7](#_Toc479719716)

[5.1.2 Guest reference price 9](#_Toc479719717)

[5.1.3 Guest view price 9](#_Toc479719718)

[5.1.4 Guest search bill of lading 9](#_Toc479719719)

[5.1.5 Guest view bill of lading list 10](#_Toc479719720)

[5.2 Admin 10](#_Toc479719721)

[5.2.1 Admin view user list 10](#_Toc479719722)

[5.2.2 Admin summary all bill of lading 11](#_Toc479719723)

[5.2.3 Admin view bill of lading list 12](#_Toc479719724)

[5.2.4 Admin search bill of lading 13](#_Toc479719725)

[5.2.5 Admin view bill of lading detail 13](#_Toc479719726)

[5.2.6 Admin view list of carrier who are auctioning 14](#_Toc479719727)

[5.2.7 Admin view carrier auction success 14](#_Toc479719728)

[5.2.8 Admin search user 16](#_Toc479719729)

[5.2.9 Admin view user profile 16](#_Toc479719730)

[5.2.10 Admin edit user profile 17](#_Toc479719731)

[5.2.11 Admin activate user 18](#_Toc479719732)

[5.2.12 Admin deactivate user 18](#_Toc479719733)

[5.2.13 Admin view price list 18](#_Toc479719734)

[5.2.14 Admin edit price list 19](#_Toc479719735)

[5.2.15 Admin add a new price 19](#_Toc479719736)

[5.2.16 Admin search report 20](#_Toc479719737)

[5.2.17 Admin view report list 21](#_Toc479719738)

[5.2.18 Admin response report 21](#_Toc479719739)

[5.2.19 Admin view profile 22](#_Toc479719740)

[5.2.20 Admin edit profile 23](#_Toc479719741)

[5.2.21 Admin change password 24](#_Toc479719742)

[5.2.22 Admin forgot password 24](#_Toc479719743)

[5.2.23 Admin login 24](#_Toc479719744)

[5.2.24 Admin logout 25](#_Toc479719745)

[5.2.25 Admin view transaction history 26](#_Toc479719746)

[5.2.26 Admin reference price 26](#_Toc479719747)

[5.2.27 Admin view price table history 27](#_Toc479719748)

[5.2.28 Admin account recharge for user 27](#_Toc479719749)

[5.2.29 Admin add company 28](#_Toc479719750)

[5.2.30 Admin edit company information 29](#_Toc479719751)

[5.3 Goods owner 30](#_Toc479719752)

[5.3.1 Goods owner view bill of lading list 30](#_Toc479719753)

[5.3.2 Goods owner view bill of lading detail 30](#_Toc479719754)

[5.3.3 Goods owner search bill of lading 31](#_Toc479719755)

[5.3.4 Goods owner view carrier auction success 32](#_Toc479719756)

[5.3.5 Goods owner view transaction history 32](#_Toc479719757)

[5.3.6 Goods owner register a new bill of lading 32](#_Toc479719758)

[5.3.7 Goods owner cancel bill of lading 33](#_Toc479719759)

[5.3.8 Goods owner edit profile 33](#_Toc479719760)

[5.3.9 Goods owner change password 34](#_Toc479719761)

[5.3.10 Goods owner forgot password 34](#_Toc479719762)

[5.3.11 Goods owner send report 35](#_Toc479719763)

[5.3.12 Goods owner view profile 35](#_Toc479719764)

[5.3.13 Goods owner view report list 35](#_Toc479719765)

[5.3.14 Goods owner search report 36](#_Toc479719766)

[5.3.15 Goods owner view price list 37](#_Toc479719767)

[5.3.16 Goods owner login 37](#_Toc479719768)

[5.3.17 Goods owner logout 38](#_Toc479719769)

[5.3.18 Goods owner comment to carrier 39](#_Toc479719770)

[5.3.19 Goods owner answer to carrier 39](#_Toc479719771)

[5.3.20 Goods owner Account recharge 40](#_Toc479719772)

[5.3.21 Goods owner reference price 41](#_Toc479719773)

[5.3.22 Goods owner confirm complete transaction 41](#_Toc479719774)

[5.3.23 Goods owner add company 42](#_Toc479719775)

[5.4 Carrier 42](#_Toc479719776)

[5.4.1 Carrier view bill of lading list 42](#_Toc479719777)

[5.4.2 Carrier view bill of lading detail 43](#_Toc479719778)

[5.4.3 Carrier auction bill of lading 43](#_Toc479719779)

[5.4.4 Carrier account recharge 43](#_Toc479719780)

[5.4.5 Carrier search bill of lading 44](#_Toc479719781)

[5.4.6 Carrier cancel bill of lading 45](#_Toc479719782)

[5.4.7 Carrier edit profile 45](#_Toc479719783)

[5.4.8 Carrier view profile 46](#_Toc479719784)

[5.4.9 Carrier change password 47](#_Toc479719785)

[5.4.10 Carrier forgot password 47](#_Toc479719786)

[5.4.11 Carrier send report 47](#_Toc479719787)

[5.4.12 Carrier view report list 48](#_Toc479719788)

[5.4.13 Carrier search report 49](#_Toc479719789)

[5.4.14 Carrier transaction history 49](#_Toc479719790)

[5.4.15 Carrier login 49](#_Toc479719791)

[5.4.16 Carrier logout 50](#_Toc479719792)

[5.4.17 Carrier comment to goods owner 51](#_Toc479719793)

[5.4.18 Carrier answer to goods owner 52](#_Toc479719794)

[5.4.19 Carrier reference price 53](#_Toc479719795)

[5.4.20 Carrier confirm complete transaction 53](#_Toc479719796)

[5.4.21 Carrier add company 53](#_Toc479719797)

[6 Other Materials 54](#_Toc479719798)

# Introduction

## Purpose

The purpose of this Software Design Document is to give a software development team overall guidance to the architecture of the software and details how the software requirements should be implemented.

## Definitions and Acronyms

# Design Oveview

# System Architecture Design

## Choice of System Architecture

Carrier Trading Center (CTC) is an e-commerce website. The main function of CTC system is provides users the ability to bid online bill of lading to help the Goods Owner optimize their shipping cost and help Carrier connect to Goods Owner more easily.

Traditionally used for desktop graphical user interfaces (GUIs), this architecture has become popular for designing web applications and even mobile, desktop and other clients. Popular programming languages like Java, C#, Ruby, PHP and others have popular MVC frameworks that are currently being used in web application development straight out of the box.

### MVC Model Overview

#### What is the MVC

Model–View–Controller (MVC) is a software architectural pattern for implementing user interfaces on computers. It divides a given application into three interconnected parts in order to separate internal representations of information from the ways that information is presented to and accepted from the user. The MVC design pattern decouples these major components allowing for efficient code reuse and parallel development.

#### Components

##### Model

**The model** is the central component of the pattern. It expresses the application's behavior in terms of the problem domain, independent of the user interface. It directly manages the data, logic and rules of the application.

##### View

**A view** can be any output representation of information, such as a chart or a diagram. Multiple views of the same information are possible, such as a bar chart for management and a tabular view for accountants.

##### Controller

**The controller** accepts input and converts it to commands for the model or view.

#### Interactions

A model stores data that is retrieved according to commands from the controller and displayed in the view.

A view generates new output to the user based on changes in the model.

A controller can send commands to the model to update the model's state (e.g., editing a document). It can also send commands to its associated view to change the view's presentation of the model (e.g., scrolling through a document).

#### Advantages and Disadvantages

##### Advantages

Simultaneous development - Multiple developers can work simultaneously on the model, controller and views.

High cohesion - MVC enables logical grouping of related actions on a controller together. The views for a specific model are also grouped together.

Low coupling - The very nature of the MVC framework is such that there is low coupling among models, views or controllers

Ease of modification - Because of the separation of responsibilities, future development or modification is easier

Multiple views for a model - Models can have multiple views

##### Disadvantages

Code navigability – The framework navigation can be complex, hence it introduces new layers of abstractions and requires users to adapt its decomposition criteria to MVC.

Multi-artifact consistency - Decomposing a feature into three artifacts causes scattering. Thus, requiring developer(s) to maintain the consistency of multiple representations at once.

Pronounced learning curve - Knowledge on multiple technologies becomes the norm. Developers using MVC need to be skilled in multiple technologies.

### JSF Framework

JSF is a server-side user interface component framework for Java-based Web applications. JSF contains an API for representing UI components and managing their state; handling events, server-side validation, and data conversion; defining page navigation; supporting internationalization and accessibility; and providing extensibility for all these features.

### JSF and MVC

JSF fits well with the MVC-based presentation-tier architecture. It offers a clean separation between behavior and presentation. It leverages familiar UI-component and Web-tier concepts without limiting you to a particular scripting technology or markup language.

JSF backing beans are the model layer (more about backing beans in a later section). They also contain actions, which are an extension of the controller layer and delegate the user request to the business-logic tier. Please note, from the perspective of the overall application architecture, the business-logic tier can also be referred to as the model layer.

### Why JSF?

JSF is not just another Web framework. The following features differentiate JSF from other Web frameworks:

* + Swing-like object-oriented Web application development: The server-side statefful UI component model with event listeners and handlers initiates object-oriented Web application development.
  + Backing-bean management: Backing beans are JavaBeans components associated with UI components used in a page. Backing-bean management separates the definition of UI component objects from objects that perform application-specific processing and hold data. JSF implementation stores and manages these backing-bean instances in the proper scope.
  + Extensible UI component model: JSF UI components are configurable, reusable elements that compose the user interfaces of JSF applications. You can extend the standard UI component and develop a more complex component, e.g., menu bar and tree component.
  + A renderer separates a UI component's functionality and view. Multiple renderers can be created and used to define different appearances of the same component for the same client or for different clients.
  + Extensible conversion and validation model: Based on the standard converters and validators, you can develop customized converters and validators, which provide better model protection.

Despite its strength, JSF is not mature at its current stage. The components, converters, and validators that ship with JSF are basic. And the per-component validation model cannot handle many-to-many validation between components and validators. In addition, JSF custom tags cannot integrate with JSTL (JSP Standard Tag Library) seamlessly.

### Managed Bean, Backing Bean, View Object, and Domain Object Model

JSF introduces two new terms: managed bean and backing bean. JSF provides a strong managed-bean facility. JavaBean objects managed by a JSF implementation are called managed beans. A managed bean describes how a bean is created and managed. It has nothing to do with the bean's functionalities.

The backing bean defines properties and handling-logics associated with the UI components used on the page. Each backing-bean property is bound to either a component instance or its value. A backing bean also defines a set of methods that perform functions for the component, such as validating the component's data, handling events that the component fires, and performing processing associated with navigation when the component activates.

A typical JSF application couples a backing bean with each page in the application. However, sometimes in the real world, forcing a one-to-one relationship between a backing bean and a page is not the ideal solution. It can cause problems like code duplication. In a real-world scenario, several pages may need to share the same backing bean behind the scenes. For example, in JCatalog, the CreateProduct and EditProduct page share the same ProductBean definition.

A view object is a model object used specifically in the presentation tier. It contains the data that must display in the view layer and the logic to validate user input, handle events, and interact with the business-logic tier. The backing bean is the view object in a JSF-based application. Backing bean and view object are interchangeable terms in this article.

Compared to the ActionForm and Action approach in Struts, development with backing beans in JSF follows better object-oriented design practices. A backing bean not only contains view data, but also behavior related to that data. In Struts, Action and ActionForm contain data and logic separately.

We've all heard about the domain object model. So, what's the difference between the domain object model and a view object? In a simple Web application, a domain object model can be used across all tiers, however, in a more complex Web application, a separate view object model needs to be used. Domain object model is about the business object and should belong in the business-logic tier. It contains the business data and business logic associated with the specific business object. A view object contains presentation-specific data and behavior. JCatalog's ProductListBean offers a good example. It contains data and logic specific to the presentation tier, e.g., pagination-related data and logic. The drawback to separating the view objects from the domain object model is that data mapping must occur between the two object models. In JCatalog, ProductBeanBuilder and UserBeanBuilder use the reflection-based Commons BeanUtils to implement the data mapping.

## Discussion of Alternative Designs

## Description of System Interface

# Detailed Design of System

## Guest

### Guest register a new account

#### Screen Design

#### Class Diagram

#### Class Specification

|  |  |  |  |
| --- | --- | --- | --- |
| **User** | | | |
| Physical address | HozyBase/Entities/User.cs | | |
| Base class |  | | |
| Attributes | | | |
| No | Name | Type | Description |
|  | Username | String |  |
|  | DisplayName | String |  |
|  | Email | String |  |
|  | CreatedDate | DateTime |  |

#### Sequence Diagram

### Guest reference price

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Guest view price

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Guest search bill of lading

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Guest view bill of lading list

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

## Admin

### Admin view user list

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

#### 

### Admin summary all bill of lading

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin view bill of lading list

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin search bill of lading

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin view bill of lading detail

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin view list of carrier who are auctioning

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin view carrier auction success

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin search user

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin view user profile

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin edit user profile

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin activate user

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin deactivate user

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin view price list

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin edit price list

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin add a new price

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin search report

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin view report list

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin response report

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin view profile

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin edit profile

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin change password

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin forgot password

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin login

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin logout

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin view transaction history

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin reference price

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin view price table history

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin account recharge for user

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin add company

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Admin edit company information

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

## Goods owner

### Goods owner view bill of lading list

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner view bill of lading detail

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner search bill of lading

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner view carrier auction success

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner view transaction history

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner register a new bill of lading

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner cancel bill of lading

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner edit profile

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner change password

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner forgot password

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner send report

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner view profile

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner view report list

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner search report

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner view price list

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner login

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner logout

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner comment to carrier

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner answer to carrier

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner Account recharge

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner reference price

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner confirm complete transaction

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Goods owner add company

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

## Carrier

### Carrier view bill of lading list

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier view bill of lading detail

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier auction bill of lading

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier account recharge

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier search bill of lading

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier cancel bill of lading

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier edit profile

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

#### 

### Carrier view profile

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier change password

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier forgot password

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier send report

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

#### 

### Carrier view report list

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier search report

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier transaction history

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier login

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier logout

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

#### 

### Carrier comment to goods owner

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier answer to goods owner

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier reference price

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier confirm complete transaction

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

### Carrier add company

#### Screen Design

#### Class Diagram

#### Class Specification

#### Sequence Diagram

# Other Materials