

**CI6225 – Enterprise Application Development**

**Individual Assignment 2**

**Technical Document**

**Travel Expense Reimbursement Application**

**V2.0**

|  |
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Contents

[1. Architecture 4](#_Toc385047231)

[1.1 Multi-Layer Architecture 4](#_Toc385047232)

[1.2 Component Architecture 4](#_Toc385047233)

[2. Design Patten 5](#_Toc385047234)

[2.1 MVC (Model-View-Controller) Patten 5](#_Toc385047235)

[2.2 Singleton Pattern 5](#_Toc385047236)

[2.3 Factory Pattern 5](#_Toc385047237)

[2.4 Facade Pattern 5](#_Toc385047238)

[2.5 Service Locator Pattern 5](#_Toc385047239)

[3. Detail Design (Infrastructure Class) 6](#_Toc385047240)

[3.1 BaseDao & BaseDaoBean 6](#_Toc385047241)

[3.2 BaseFacade & BaseFacadeBean 6](#_Toc385047242)

[3.3 BaseAction 7](#_Toc385047243)

[4. Detail Design (POJO Class) 8](#_Toc385047244)

[4.1 ClaimForm 8](#_Toc385047245)

[4.2 ClaimFormItem 8](#_Toc385047246)

[4.3 ClaimType 8](#_Toc385047247)

[4.4 Department 9](#_Toc385047248)

[4.5 FormStatus 9](#_Toc385047249)

[4.6 OperationArea 9](#_Toc385047250)

[4.7 Region 9](#_Toc385047251)

[4.8 User 10](#_Toc385047252)

[5. Detail Design (Data Access Object Class) 11](#_Toc385047253)

[5.1 ClaimFormDao and ClaimFormDaoBean 11](#_Toc385047254)

[5.2 ClaimFormItemDao and ClaimFormItemDaoBean 11](#_Toc385047255)

[5.3 ClaimTypeDao and ClaimTypeDaoBean 11](#_Toc385047256)

[5.4 Department Dao and Department DaoBean 11](#_Toc385047257)

[5.5 FormStatusDao and FormStatusDaoBean 11](#_Toc385047258)

[5.6 OperationAreaDao and OperationAreaDaoBean 11](#_Toc385047259)

[5.7 RegionDao and RegionDaoBean 11](#_Toc385047260)

[5.8 UserDao and UserDaoBean 11](#_Toc385047261)

[6. Detail Design (Façade Java Bean Class) 12](#_Toc385047262)

[6.1 ClaimFormFacade & ClaimFormFacadeBean 12](#_Toc385047263)

[6.2 ClaimFormItemFacade & ClaimFormItemFacadeBean 12](#_Toc385047264)

[6.3 ClaimTypeFacade & ClaimTypeFacadeBean 13](#_Toc385047265)

[6.4 DepartmentFacade & DepartmentFacadeBean 13](#_Toc385047266)

[6.5 FormStatusFacade & FormStatusFacadeBean 13](#_Toc385047267)

[6.6 OperationAreaFacade & OperationAreaFacadeBean 13](#_Toc385047268)

[6.7 RegionFacade & RegionFacadeBean 13](#_Toc385047269)

[6.8 UserFacade & UserFacadeBean 13](#_Toc385047270)

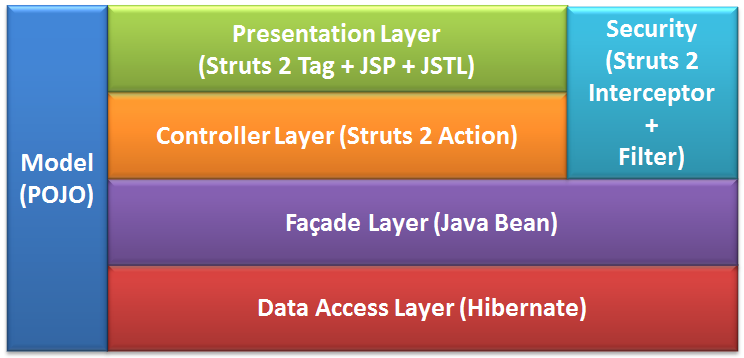
[7. Action 14](#_Toc385047271)

[8. JSP 14](#_Toc385047272)

# 1. Architecture

## 1.1 Multi-Layer Architecture

This application is based on multi-layer architecture design and implementation, for each layer, the responsibility is:



**1) Data Access Layer**

This layer is to handle the data interaction between Java application and database. It is using Hibernate Session Factory and Session to manager database connection and persistence.

**2) Facade Layer**

The façade is centralized the business logic by each module, such as User module, Department module and Claim Form module. It is also using a FacadeServiceLocator to assign façade to controller layer.

**3) Controller Layer**

It uses Struts 2 Action to handle to HTTP request from presentation layer.

**4) Presentation Layer**

It is using Struts 2, JSP, and JSTL to display content from controller. There is JavaScript and AJAX invoked to deal with validation logic.

**5) Model**

It is POJO plus the Hibernate mapping XML configuration to deal with ORM logic.

**6) Security**

Using Struts 2 Interceptor to handle user login status checking logic, also, a security filter is helping to checking the JSP page access also. CookieUtil is to keep application recognize user in 1 week.

## 1.2 Component Architecture

There are 3 components in this project:

**1) Infrastructure Component**

To handle all common function from DAO, Façade layer.

**2) Application Component**

To handle major business logic such as claim form, user, and department.

**3) Report Component**

To handle online report and download report logic.(Will not be included in this document)

# 2. Design Patten

## 2.1 MVC (Model-View-Controller) Patten

The view (Strut 2 tag, JSP and JSTL in presentation layer) is handling the display function; meanwhile the controller (Strut 2 Action) is handling the web flow logic from the input of the user action. Model (POJO) wrap the parameters to become object and transfer between view and controller, and finally persistent into database.

## 2.2 Singleton Pattern

For some of utility object, to reduce the frequency and quantity about the object instance, using singleton pattern to maintain only one copy of object.

## 2.3 Factory Pattern

Inside the report module, as there is more than 1 types of reports, using factory pattern to return the specify instance by input parameter.

## 2.4 Facade Pattern

Facade Bean (Java Bean) now is handling code of business logic in this application and hide the complexity of the logic, instead, to provide a simple interface.

## 2.5 Service Locator Pattern

There is a service locator uses a central registry for all of facade bean.

# 3. Detail Design (Infrastructure Class)

About more detail and completed class information, you can refer to this application’s Java Doc.

## 3.1 BaseDao & BaseDaoBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **BaseDaoBean** | |
| **Type** | **Dao** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.infr.dao** | |
| Attribute | SESSION\_FACTORY : SessionFactory | |
| Method | buildSessionFactory() : SessionFactory | Initial Hibernate Session Factory |
| closeSession(Session) : void | Close Session |
| delete(E) : void | Delete Record in The Database |
| delete(Long) : void | Delete Record in the Database |
| getNativeQueryResult(String, Object[]) : List<ResultSetPojo> | Get native Query Result |
| getQueryResult(String, Object[]) : List<E> | Gets The Query Result |
| getQuerySingleResult(String , Object[]) : E | Gets The Query Single Result |
| getSession() : Session | Get Session |
| insert (T) : void | Insert a New Record in The Database |
| returnNamedQuery(String, Object[]) : List<E> | Return Named Query |
| selectAll() : List<E> | Update The Information of The Particular Object |
| selectAll(String[], boolean) : List<E> | Retrieve All The Objects in The Database |
| selectById(E) : E | Retrieve All the Objects in The Database |
| selectById(Long) : E | Retrieve The Object Based on Id |
| update(E) : void | Update The Objects in The Database |

## 3.2 BaseFacade & BaseFacadeBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **BaseFacadeBean** | |
| **Type** | **Facade Bean** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.infr.facade** | |
| Attribute |  |  |
| Method | delete (E) : void | Delete Record in The Database |
| delete(Long) : void | Delete Record in The Database |
| insert(E) : void | Insert a New Record in The Database |
| selectAll() : List<E> | Retrieve All The Objects in The Database |
| selectAll(String[], boolean) : List<E> | Retrieve All The Objects in The Database |
| selectById(E) : E | Retrieve The Object Based on Id |
| selectById(Long) : E | Retrieve The Object Based on Id |
| update(E) : void | Update The Objects in The Database |

## 3.3 BaseAction

|  |  |  |
| --- | --- | --- |
| **Class Name** | **BaseAction** | |
| **Type** | **com.opensymphony.xwork2.ActionSupport** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.infr.web.action** | |
| Attribute | ACTION\_AJAX : String | Static Variable for Ajax Action |
| ACTION\_CREATE : String | Static Variable for Create Action |
| ACTION\_DELETE : String | Static Variable for Delete Action |
| ACTION\_EDIT : String | Static Variable for Edit Action |
| ACTION\_LIST : String | Static Variable for List Action |
| ACTION\_VIEW : String | Static Variable for View Action |
| REMEMBER\_ME\_COOKIE | Static Variable for Remember Me Cookie Action |
| Method | doGetCreate() : String | Handling Do Get Create Action |
| doGetDelete() : String | Handling Do Get Delete Action |
| doGetEdit() : String | Handling Do Get Edit Action |
| doGetList() : String | Handling Do Get List Action |
| doGetView() : String | Handling Do Get View Action |
| doPostCreate() : String | Handling Do Post Create Action |
| doPostEdit() : String | Handling Do Post Edit Action |
| getFacade() : F | Get Façade Java Bean by Module specify |
| getNewEntity() : E | Get new POJO Bean by Module Specify |
| getSessionUser() : User | Get the User From Session |
| removeSessionUser() : void | Remove User From Session |
| setAccessRight(User) : void | Set The Access Right |
| setClaimTypes(HttpServletRequest) : void | Set All Claim Types into Request |
| setDepartments(HttpServletRequest) : void | Set All Departments into Request |
| setErrorMessage(HttpServletRequest, String) : void | Set Error Message |
| setFormStatuses(HttpServletRequest) : void | Set All Form Statuses into Request |
| setMessage(HttpServletRequest, String) : void | Set Message |
| setMonths(HttpServletRequest) : void | Set All Months into Request |
| setOperationAreas(HttpServletRequest) : void | Set All Operation Areas into Request |
| setRegions(HttpServletRequest) : void | Set All Regions into Request |
| setSessionUser(HttpServletRequest, User user) : void | Set User into Session |
| setUsers(HttpServletRequest) : void | Set All Users into Request |
| setYears(HttpServletRequest) : void | Set All Years into Request |

# 4. Detail Design (POJO Class)

About more detail and completed class information, you can refer to this application’s Java Doc.

## 4.1 ClaimForm

|  |  |  |  |
| --- | --- | --- | --- |
| **Class Name** | **ClaimForm** | | |
| **Type** | **POJO** | | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.model** | | |
| Attribute | id | Long | ID of Claim Form |
| approvedByFinancial | User | Approved By Financial |
| approvedByFinancialTime | Date | Approved By Financial Time of Claim |
| approvedByManager | User | Approved By Manager of Claim |
| approvedByManagerTime | Date | Approved By Manager Time of Claim |
| claimFormItems | List<ClaimFormItem> | Claim Item Details |
| department | Department | Department of Claim |
| formStatus | FormStatus | Form Status of Claim |
| rejectBy | User | Reject By |
| rejectTime | Date | Reject Time |
| total | BigDecimal | Total amount for Claim Form |
| travelOfMonth | String | Travel Of Month |
| travelOfYear | String | Travel Of Year |
| user | User | User Who Request This Claim Form |

## 4.2 ClaimFormItem

|  |  |  |  |
| --- | --- | --- | --- |
| **Class Name** | **ClaimFormItem** | | |
| **Type** | **POJO** | | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.model** | | |
| Attribute | id | Long | ID of Claim Form Item |
| claimAmount | BigDecimal | Claim Amount |
| claimDate | Date | Claim Date |
| claimDescription | String | Claim Description |
| claimForm | ClaimForm | Claim Form |
| claimType | int | Claim Type |

## 4.3 ClaimType

|  |  |  |  |
| --- | --- | --- | --- |
| **Class Name** | **ClaimType** | | |
| **Type** | **POJO** | | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.model** | | |
| Attribute | id | Long | ID of Claim Type |
| claimType | String | Claim Type of Claim |
| claimFormItems | Set | Claim Form Items |

## 4.4 Department

|  |  |  |  |
| --- | --- | --- | --- |
| **Class Name** | **Department** | | |
| **Type** | **POJO** | | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.model** | | |
| Attribute | id | Long | ID of Department |
| claimForms | List<ClaimForm> | Claim Forms of The Department |
| departmentName | String | Department Name |
| manager | User | Manager of The Department |
| officeAddress | String | Office Address of The Department |
| operationArea | OperationArea | Operation Area of The Department |
| region | Region | Region of The Department |
| telephoneNumber | String | Telephone Number |
| users | List<User> | Users of The Department |

## 4.5 FormStatus

|  |  |  |  |
| --- | --- | --- | --- |
| **Class Name** | **FormStatus** | | |
| **Type** | **POJO** | | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.model** | | |
| Attribute | id | Long | ID of Form Status |
| formStatus | String | Form Status |
|  | claimForms | Set | Claim Forms |

## 4.6 OperationArea

|  |  |  |  |
| --- | --- | --- | --- |
| **Class Name** | **OperationArea** | | |
| **Type** | **POJO** | | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.model** | | |
| Attribute | id | Long | ID of Operation Area |
| areaName | String | Area Name |
| isFinancial | String | If is Financial |
|  | depts | Set | Departments |

## 4.7 Region

|  |  |  |  |
| --- | --- | --- | --- |
| **Class Name** | **Region** | | |
| **Type** | **POJO** | | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.model** | | |
| Attribute | id | Long | ID of Region |
| regionName | String | Region Name |
|  | depts | Set | Departments |

## 4.8 User

|  |  |  |  |
| --- | --- | --- | --- |
| **Class Name** | **User** | | |
| **Type** | **POJO** | | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.model** | | |
| Attribute | id | Long | ID of User |
| birthDate | String | Birth Date |
| department | Department | Department |
| emailAddr | String | Email Address |
| firstName | String | First Name |
| gender | String | Gender |
| isAdmin | String | If is Admin |
| isApprover | Boolean | If is Approver |
| isFinancial | Boolean | If is Financial |
| lastName | String | Last Name |
| password | String | Password |
| userName | String | User Name |

# 5. Detail Design (Data Access Object Class)

About more detail and completed class information, you can refer to this application’s Java Doc.

## 5.1 ClaimFormDao and ClaimFormDaoBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **ClaimFormDaoBean** | |
| **Type** | **Dao** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.dao.impl** | |
| Method | getEntityClass() :Class<ClaimForm> | Get POJO Class for Claim Form |

## 5.2 ClaimFormItemDao and ClaimFormItemDaoBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **ClaimFormItemDaoBean** | |
| **Type** | **Dao** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.dao.impl** | |
| Method | getEntityClass() :Class<ClaimFormItem> | Get POJO Class for Claim Form Item |

## 5.3 ClaimTypeDao and ClaimTypeDaoBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **ClaimTypeDaoBean** | |
| **Type** | **Dao** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.dao.impl** | |
| Method | getEntityClass() :Class<ClaimType > | Get POJO Class for Claim Type |

## 5.4 Department Dao and Department DaoBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **DepartmentDaoBean** | |
| **Type** | **Dao** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.dao.impl** | |
| Method | getEntityClass() :Class< Department > | Get POJO Class for Department |

## 5.5 FormStatusDao and FormStatusDaoBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **FormStatusDaoBean** | |
| **Type** | **Dao** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.dao.impl** | |
| Method | getEntityClass() :Class<FormStatus> | Get POJO Class for Form Status |

## 5.6 OperationAreaDao and OperationAreaDaoBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **OperationAreaDaoBean** | |
| **Type** | **Dao** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.dao.impl** | |
| Method | getEntityClass() :Class<OperationArea> | Get POJO Class for Operation Area |

## 5.7 RegionDao and RegionDaoBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **RegionDaoBean** | |
| **Type** | **Dao** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.dao.impl** | |
| Method | getEntityClass() :Class<Region> | Get POJO Class for Region |

## 5.8 UserDao and UserDaoBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **UserDaoBean** | |
| **Type** | **Dao** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.dao.impl** | |
| Method | getEntityClass() :Class<User> | Get Entity Class for User |

# 6. Detail Design (Façade Java Bean Class)

About more detail and completed class information, you can refer to this application’s Java Doc.

## 6.1 ClaimFormFacade & ClaimFormFacadeBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **ClaimFormFacadeBean** | |
| **Type** | **Facade Java Bean** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.facade.impl** | |
| Attribute | claimFormDao : ClaimFormDao | |
| Method | approveFormByDepartment (ClaimForm) : void | Approve Form By Department |
| approveFormByFinancial (ClaimForm) :void | Approve Form By Financial |
| getClaimFormByUser(User) List<Department> | Get Claim Form By User |
| getClaimFormsApprovedWiItems (User) : void | Get Claim Forms Approved With Items |
| getClaimFormsForChart (User, List<String>, Map<String, List<BigDecimal>>) : void | Get Claim Forms For Chart |
| getClaimFormsForYourApproval(User) : List<ClaimForm> | Get Claim Forms For Your Approval |
| getClaimFormsPendingForApproval(User) :List<ClaimForm> | Get Claim Forms Pending For Approval |
| getDao() : ClaimFormDao | Get Dao |
| getTypesOfClaimFormByUser(User) : Map<Long, List<ClaimForm>> | Get Types Of Claim Form By User |
| reject(ClaimForm claimForm) | Reject Claim Form |
| resetFromRejectStatus (ClaimForm claimForm) : void | Reset From Reject Status |
| submitForm(ClaimForm claimForm) :void | Submit Form |
| updateTotal(ClaimForm claimForm) :void | Update Total Amount |

## 6.2 ClaimFormItemFacade & ClaimFormItemFacadeBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **ClaimFormItemFacadeBean** | |
| **Type** | **Facade Java Bean** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.facade.impl** | |
| Attribute | claimFormItemDao : ClaimFormItemDao | |
| Method | createAndUpdateTotal(ClaimFormItem) :void | Create And Update Total Claim Form Item |
| deleteAndUpdateTotal(Long) :void | Delete And Update Total Claim Form Item |
| getAllItemsByFormId(Long) : List<ClaimFormItem> | Get All Items By Form Id |
| getDao() : ClaimFormItemDao | Get Dao |
| updateAndUpdateTotal(ClaimFormItem) :void | Update And Update Total Claim Form Item |

## 6.3 ClaimTypeFacade & ClaimTypeFacadeBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **ClaimType FacadeBean** | |
| **Type** | **Facade Java Bean** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.facade.impl** | |
| Attribute | claimTypeDao : ClaimTypeDao | |
| Method | getDao() : ClaimTypeDao | Get Dao |

## 6.4 DepartmentFacade & DepartmentFacadeBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **DepartmentFacadeBean** | |
| **Type** | **Facade Java Bean** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.facade.impl** | |
| Attribute | departmentDao : DepartmentDao | |
| Method | deleteDepartmentWithUsers(Long) :void | Delete Department With Users |
| getAllFinancialDepartments() :List<Department> | Get All Financial Departments |
| getCurrentDepartmentManager(User) : User | Get Current Department Manager |
| getDao() : DepartmentDao | Get Dao |
| getDepartmentByName(String) : Department | Get Department By Name |

## 6.5 FormStatusFacade & FormStatusFacadeBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **FormStatusFacadeBean** | |
| **Type** | **Facade Java Bean** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.facade.impl** | |
| Attribute | formStatusDao : FormStatusDao | |
| Method | getDao() : FormStatusDao | Get Dao |

## 6.6 OperationAreaFacade & OperationAreaFacadeBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **OperationAreaFacadeBean** | |
| **Type** | **Session Facade Bean** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.facade.impl** | |
| Attribute | operationAreaDao : OperationAreaDao | |
| Method | getDao() : OperationAreaDao | Get Dao |

## 6.7 RegionFacade & RegionFacadeBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **RegionFacadeBean** | |
| **Type** | **Session Facade Bean** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.facade.impl** | |
| Attribute | regionDao : RegionDao | |
| Method | getDao() : RegionDao | Get Dao |

## 6.8 UserFacade & UserFacadeBean

|  |  |  |
| --- | --- | --- |
| **Class Name** | **UserFacadeBean** | |
| **Type** | **Session Facade Bean** | |
| **Package** | **sg.edu.ntu.wkw.msc.is.ead.\_2014.tera.v2.app.facade.impl** | |
| Attribute | userDao : UserDao | |
| Method | createUserWithPassword(User) : User | Create User With Password |
| getDao() : UserDao | Get Dao |
| getRandomPassword() : String | Get Random Password |
| getUnAssignUsers() : List<User> | Get Un Assign Users |
| getUserByName(String) : User | Get User By Name |
| getUsersByDepartment(Long) : List<User> | Get Users By Department |
| signin(User) : User | Sign in User |
| varifyUser(User) : User | Verify User |

# 7. Action

|  |  |
| --- | --- |
| **Servlet Name** | **Functionality** |
| ClaimFormRoot | Root contains all attributes from front end for Claim Form module |
| ClaimFormAction | Action is a controller to handle all web action for Claim Form module |
| DepartmentSRoot | Root contains all attributes from front end for Department module |
| DepartmentSAction | Action is controller to handle all web action for Department module |
| UserRoot | Root contains all attributes from front end for User module |
| UserAction | Action is controller to handle all web action for User module |

# 8. JSP

|  |  |
| --- | --- |
| **JSP File** | **Functionality** |
| **claimForm** | |
| create.jsp | Page to add a new claim form |
| createItem.jsp | Page to add a new claim form item |
| edit.jsp | Page to edit a claim form |
| editItem.jsp | Page to edit a claim form item |
| list.jsp | Page to list all claim forms |
| monitor.jsp | Page to monitor claim forms |
| view.jsp | Page to view a claim form |
| viewItem.jsp | Page to view a claim form item |
| **common** | |
| ajax\_result.jsp | Contain the ajax result of the jsp |
| chart.jsp | Contain the chart of the jsp |
| foot\_copyright.jsp | Contain the footer copyright of the jsp |
| foot\_scipt.jsp | Contain the footer script of the jsp |
| head.jsp | Contain the header of the jsp |
| menu.jsp | Contain the menu of the jsp |
| message.jsp | Contain the message of the jsp |
| navigation.jsp | Contain the navigation of the jsp |
| **department** | |
| create.jsp | Page to add a new department |
| edit.jsp | Page to edit a department |
| list.jsp | Page to list all departments |
| view.jsp | Page to view a department |
| **error** | |
| not\_found\_error.jsp | Page to redirect when meet not found error |
| unknown\_error.jsp | Page to redirect when meet unknown error |
| **report** | |
| edit1.jsp | Page to edit a report 1 |
| edit2.jsp | Page to edit a report 2 |
| list.jsp | Page to list all reports |
| **user** | |
| create.jsp | Page to add a new user |
| edit.jsp | Page to edit a user |
| editPassword.jsp | Page to edit user password |
| list.jsp | Page to list all users |
| signin.jsp | Page to sign in a user |
| signout.jsp | Page after sign out a user |
| view.jsp | Page to view a user |
| viewDashboard.jsp | Page to view dashboard |