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| SE 577: Software Architecture    **Train Ticket System**  **Group Homework #1: Modeling**    Shivani Aggarwal  Jijo George  Vighnajeet Naik  Priya Thotta Jayachandran        21-March-2020 |
| **1** **Introduction** This document details how the intended users are expected to interact with the proposed TrainTicket Application to execute various functionalities. This document makes use of UML Use Cases , Component diagram and deployment diagram for the same.   The TrainTicket application will allow customers connected over a network to book a train ticket from one location to various other destinations covering all America via their desktop, laptop or mobile devices.   Our TrainTicket strives to deliver a high quality, safe, on-time rail passenger service that exceeds customer expectations. Our TrainTicket application tend to connect America in safer, greener and healthier ways.  The technology stack that will be used by us in our application would include the below:   * Spring Boot * Spring MVC * Spring Data JPA * Services * Eclipse/STS * Bootstrap * PostgresSQL * Java 8   The following details include Use Cases which is divided into preconditions, flow of events, exceptional flow of events, scenarios, UML Component and Deployment Diagram. **2 Use Case implementation** This section will describe several use cases for the TrainTicket application. These are common major use cases that  users will encounter while using the application. This includes a UML use case diagram showing all major stakeholders and major functions as use cases, a simple explanation of each use case with their flow of events and for each use case, 3 user stories, i.e. scenarios,  that can be used as the starting point of implementation.  Below are the major use cases that have been covered:  **For Travelers:**   1. Search tickets 2. Display available itineraries, e.g., sorting and filtering 3. Add to cart, e.g. with/without discount options 4. Check out 5. Sign in/Register (you need to model this use case, but do not need to implement this part) 6. Manage user profile for registered users   **For Admins:**   1. Manage orders 2. Manage Users (of the system) 3. Manage Customers (registered or unregistered travelers) 4. Manage Groups 5. Manage itineraries, e.g. adding stops, manage available tickets, route info 6. Manage user info, such as billing address, age,  name. 7. Payment management   The Admin can act as a traveler and would have all the required above use cases of traveler as well.    The various use cases are illustrated in Figure 1.    **Figure 1: A Use-Case diagram of the TrainTicket system.**  **For Travelers:**   * **Use Case 1: Search Tickets**   **Description:**  This describes the process to search for a train ticket as required by the user.  **Pre-Conditions:**   1. The device must have an active network connection. 2. The device must have the application opened on the device.   **Actors:**  Traveler  **Flow of events:**   1. The use case starts when a traveler opens the landing page. 2. The traveler gets the option to search for trains on the landing page. 3. The traveler selects the type of trip(one-way , round trip) along with entering the details such as source , destination , date of travel, number of travelers and clicks on “Find Trains” button. 4. The traveler also gets an option to search for the ticket on basis of the time of the day. 5. The traveler sees the list of available trains/tickets as per the selection made above. 6. The traveler choose/add to cart the relevant ticket and proceed for checkout. 7. The use case ends.   **Exceptional flow of events:**   1. The traveler can disconnect , or close before any search results are found. If this happens no trains/tickets will come up and the use case ends. 2. The traveler can also enter wrong details for the search . If this happens no train/tickets will come up and the use case ends.   **Scenarios/User stories:**   1. The traveler will have an option to search tickets either for one-way or round-trip by selecting date and time of the travel, and the system will display the search results. 2. The traveler will get an error alert message with no search results if the source and destination entered are same. 3. The traveler will have to mandatorily fill in the source, destination and date of the travel details as part of validation in order to proceed for finding the trains.  * **Use Case 2: Display** **available itineraries, e.g. sorting and filtering**   **Description:**  This describes the process to display available itineraries such as sorting and filtering after the search has been initiated by the traveler.  **Pre-Conditions:**   1. The device must have an active network connection. 2. The device must have the application opened on the device.   **Actors:**  Traveler  **Flow of events:**   1. The use case starts when a traveler gets onto the page with list of trains/tickets on basis of the search. 2. The traveler gets the option of filtering the trains by time of the day to display the list accordingly. 3. The traveler gets the option to choose on Crescent trains or other trains. 4. The traveler gets an option to sort the trip by duration , departure time and fare. 5. The traveler’s itinerary gets finalized and displayed on basis of selection of above options. 6. The use case ends.   **Exceptional flow of events:**   1. The traveler can disconnect , or close before selecting any itinerary. If this happens no trains/tickets and itinerary for the same will be displayed and the use case ends.   **Scenarios/User stories:**   1. The traveler will have an option to filter trains on a selected time of the day, select the desired train from the list of options displayed by the application and add to the itinerary. 2. The traveler will have an option filter only crescent trains and the system will display results accordingly for the user to choose either crescent trains or remove the filter to view all other trains and add to the itinerary. 3. The traveler will have an option to sort the trip by duration, departure time or fare for which the system will display results accordingly.  * **Use Case 3: Add to cart (with or without discount options)**   **Description:**  This describes the process to add the selected ticket to cart after the search and itinerary has been decided by the traveler.  **Pre-Conditions:**   1. The device must have an active network connection. 2. The device must have the application opened on the device.   **Actors:**  Traveler  **Flow of events:**   1. The use case starts when a traveler gets onto the page after finalizing the train/ticket along with itinerary and add it to the cart for further checkout process. 2. The traveler gets multiple filter and sort options to have the list of trains accordingly such as filter by crescent train , sort by departure time/fare/journey duration. 3. The traveler gets a discount on basis of the category they choose and are into such as adult , senior citizen , passenger with disability , rail passenger assoc. adult , Military adult. 4. The traveler doesn’t get any discount if they don’t choose any of the above category. 5. The traveler clicks on “Add to cart” button , hence finalizing on the itinerary and train/ticket for further checkout. 6. The use case ends.   **Exceptional flow of events:**   1. The traveler can disconnect , or close before deciding on any filters and finalizing the itinerary and train/ticket. If this happens no trains/tickets and itinerary for the same will be added to card and be available for checkout. The use case ends.   **Scenarios/User stories:**   1. The traveler will have an option to add the desired train into the cart from where the user can proceed with checkout. 2. The traveler will get an error alert if he tries to add the train/ticket to cart without selecting at least one train from the list of trains available. 3. The traveler will have an option to get a discount on basis of the category they choose such as a senior citizen, passenger with disability, rail passenger assoc. adult, Military adult.      * **Use Case 4: Checkout**   **Description:**  This describes the process to proceed with checkout after the search and itinerary has been finalized by the traveler.  **Pre-Conditions:**   1. The device must have an active network connection. 2. The device must have the application opened on the device.   **Actors:**  Traveler  **Flow of events:**   1. The use case starts when a traveler gets onto the page of checking out after adding the chosen train/ticket into the cart. 2. The traveler would be taken to the page to confirm the traveler’s details such as name , email address and phone number. 3. The traveler gets an option to receive alerts such as for delay schedules. 4. The traveler gets an option to choose if they want to add a protection plan to their trip or not. 5. The traveler gets an option to review the purchase and modify any details if required. 6. The traveler would be asked for the payment via credit/debit cards or would also be able to use the gift cards for the same. 7. The traveler further confirms everything and check out the purchase. 8. The use case ends.   **Exceptional flow of events:**   1. The traveler can disconnect , or close before checking out the purchase of the train ticket. If this happens no trains/tickets for the same will be confirmed and available. The use case ends.   **Scenarios/User stories:**   1. After adding trains to cart and proceeding to checkout, the traveler will have to enter the details such as name, email address and phone without which they won’t be able to proceed further for checking out. 2. The traveler will have an option to add a protection plan if desired during the checkout, if not, the system will allow the user to checkout directly. 3. The traveler will get an option to pay via any credit/debit using stripe payment to have secure checkout.  * **Use Case 5: Sign in/Register**   **Description:**  This describes the process to sign in /register on our TrainTicket application.  **Pre-Conditions:**   1. The device must have an active network connection. 2. The device must have the application opened on the device.   **Actors:**  Traveler  **Flow of events:**   1. The use case starts when a traveler gets onto the Home page where they get an option of sign in or join as a new user. 2. The traveler gets an option to Sign in or Register on the welcome page. 3. The traveler logins with username and password if credentials exist. 4. The traveler selects the “Register” option. 5. The traveler enters their first name, last name, country , email address and password. 6. The traveler clicks on "Create an Account" button. 7. If the traveler has filled out all fields with valid information, the application will change view to the Home Screen. 8. If the traveler did not fill out all of the fields with valid information, they will be prompted to fill out the invalid or missing information. 9. The use case ends .   **Exceptional flow of events:**   1. The traveler can disconnect , or close before signing in or registering on our TrainTicket application. If this happens no user would be able to sign in or register as a member of our TrainTicket application. The use case ends.   **Scenarios/User stories:**   1. The traveler will be able to login into the application with valid credentials in github or google. 2. The traveler will have to register through either github or google if the credential does not exist. 3. The traveler will have to fill all the required fields in github or google using correct format meeting the validation criteria post which only user can register and get login credentials.  * **Use Case 6: Manage user profile for registered users**   **Description:**  This describes the process to manage user profile if user has registered on our TrainTicket application.  **Pre-Conditions:**   1. The device must have an active network connection. 2. The device must have the application opened on the device.   **Actors:**  Traveler  **Flow of events:**   1. The use case starts when a traveler signed in as a registered user and is inside the TrainTicket application. 2. The traveler gets an option “Manage profile” to manage the profile related details. 3. The traveler gets an option to modify the personal details such as name , email address and Phone numbers. 4. The traveler gets an option of “Change password” in case they want to alter the password. 5. The traveler gets an option of “Billing Address” to add/modify the billing address for the receiving the transaction statement. 6. The traveler gets an option of “Payment methods” to save the particular payment method such as credit/debit/gift card they want to use every time they purchase a ticket. 7. The traveler gets an option to save preferences such as save favorite source and destination. 8. The traveler gets an option of “Avail discounts” by saving the passenger type information such as adult , senior citizen , passenger with disability , rail passenger assoc. adult , Military adult. 9. The traveler also gets an option of “Get deals/offers” to apply for having monthly e-statement or monthly guest offers. 10. The use case ends .   **Exceptional flow of events:**   1. The traveler can disconnect , or close before signing in or did not register at all in our TrainTicket application won’t get an option to manage profile . If this happens no user would be able to avail offers and manager user profile our TrainTicket application. The use case ends.   **Scenarios/User stories:**   1. The traveler will have an option to modify the personal details such as name, email address and phone number in my profile tab. Also, they would be able to change their passwords in case required. 2. The traveler will see an option to add and save the billing address which includes filling in street address , zip code , city and state . The details should be validated and same as on the card being used in order to be saved and make a successful purchase. 3. The traveler can add and save the payment method such as credit/debit and details such as card number ,expiration date and CVV.   **For Admins:**   * **Use Case 1: Manage orders**   **Description:**  This describes the ability of Admin to manage orders on the website.  **Pre-Conditions:**   1. The device must have an active network connection. 2. The device must have the application opened on the device. 3. The User must be logged in as an admin.   **Actors:**  Admin  **Flow of events:**   1. The Use case starts when the user login as an admin. 2. The User enters admin login credentials and clicks on “Logon” button. 3. The Admin will be landed onto the Home page. 4. The Admin clicks on “Orders” tab. 5. The Admin sees the list of orders on the website. 6. The Admin can see the details of any of the orders made on the website. 7. The Admin modifies the details , review the order and change the status of the order to any of the ordered , processed , delivered ,refunded , cancelled accordingly and save the settings by clicking on “Save” button. 8. The Admin sends email invoice , order status email , reviews purchase list. 9. The use case ends.   **Exceptional flow of events:**   1. The admin can disconnect , or close before signing in and doing any order manipulations as an admin on the TrainTicket application. If this happens no order management would be done on the TrainTicket application. The use case ends.   **Scenarios/User stories:**   1. The Admin will be able to view the list of orders made by users in the application using admin login. 2. The Admin will be able to change the status of the order to any of the ordered , processed , delivered ,refunded , cancelled and click on “Save” . 3. The Admin will send email invoice , order status email to the traveler after successful checkout.  * **Use Case 2: Manage Users (of the system)**   **Description:**  This describes the ability of Admin to manage users on the website.  **Pre-Conditions:**   1. The device must have an active network connection. 2. The device must have the application opened on the device. 3. The User must be logged in as an admin.   **Actors:**  Admin  **Flow of events:**   1. The Use case starts when the user login as an admin. 2. The User enters admin login credentials and clicks on “Logon” button. 3. The Admin will be landed onto the Home page. 4. The Admin clicks on “Profile” tab. 5. The Admin gets an option to manage their profile , change password , create a traveler , view all travelers. 6. The Admin clicks on “Users” option to view the all the list of users. 7. The Admin clicks on “Create a User” and fill in details such as username , first name , last name , password , email, Phone number. 8. The Admin gets an option to assign particular role such as admin or normal user to the user. 9. The Admin clicks on “Save” to save the traveler. 10. The use case ends.   **Exceptional flow of events:**   1. The admin can disconnect , or close before signing in and doing any changes as an admin on the TrainTicket application. If this happens no user profiles would be manipulated on the TrainTicket application. The use case ends.   **Scenarios/User stories:**   1. The Admin will get an option to view the list of all users existing on the system while logged in as admin. 2. The Admin will be able to create a new user by filling the information such as username , first name , last name , password , email, Phone number and will not be able to create a user without filling the required fields , hence , would require adhering to validations imposed on the form. 3. The Admin will get an option to align a role to the user such as admin or can leave the user as a normal user.  * **Use Case 3: Manage Customers (registered or unregistered travelers)**   **Description:**  This describes the ability of Admin to manage customers of the website.  **Pre-Conditions:**   1. The device must have an active network connection. 2. The device must have the application opened on the device. 3. The User must be logged in as an admin.   **Actors:**  Admin  **Flow of events:**   1. The Use case starts when the user login as an admin. 2. The User enters admin login credentials and clicks on “Logon” button. 3. The Admin will be landed onto the Home page. 4. The Admin clicks on “Customers” tab. 5. The Admin sees the list of customers on the website along with various customer options. 6. The Admin gets the option to see/review the details of any of the available customers on the website. The customer can be either registered or guest customers. 7. The Admin gets the option to modify the details such as order status , basic information of the customer and save it by clicking on “Save” button. 8. The use case ends.   **Exceptional flow of events:**   1. The admin can disconnect , or close before signing in and doing any changes as an admin on the TrainTicket application. If this happens no customer details would be manipulated on the TrainTicket application. The use case ends.   **Scenarios/User stories:**   1. The Admin will be able to view the details of customers(registered/unregistered) in the application. 2. The Admin will have an option to create a new customer by filling Name , country , email address , password , phone number, billing address . 3. The Admin will be able to reset password /set credentials for any existing customer.  * **Use Case 4: Manage Groups**   **Description:**  This describes the ability of Admin to manage groups on the website.  **Pre-Conditions:**   1. The device must have an active network connection. 2. The device must have the application opened on the device. 3. The User must be logged in as an admin.   **Actors:**  Admin  **Flow of events:**   1. The Use case starts when user login as an admin. 2. The User enters admin login credentials and clicks on “Logon” button. 3. The Admin will be landed onto the Home page. 4. The Admin clicks on “Profile” tab. 5. The Admin gets an option of “Security” that includes managing “Groups” and Create a new “Group”. 6. The Admin can view the details of any existing group by clicking on “Details” button. 7. The Admin can delete any group by clicking on red ‘-‘ button. 8. The Admin can create a new group by filling Group Name , Type of Group such as Admin , Traveler and hitting on “Save” button. 9. The use case ends.   **Exceptional flow of events:**   1. The admin can disconnect , or close before signing in and doing any changes as an admin on the TrainTicket application. If this happens no groups would be manipulated on the TrainTicket application. The use case ends.   **Scenarios/User stories:**   1. The Admin will be able to view the details such as ID , Name , Type for all the listed groups. 2. The Admin will be able to delete a group as required. 3. The Admin will be able to create a new group by filling the Group Name , Type of Group such as Admin, Traveler details and saving the same.  * **Use Case 5: Manage itineraries, e.g. adding stops, manage available tickets, route info**   **Description:**  This describes the ability of Admin to manage itineraries information on the website.  **Pre-Conditions:**   1. The device must have an active network connection. 2. The device must have the application opened on the device. 3. The User must be logged in as an admin.   **Actors:**  Admin  **Flow of events:**   1. The Use case starts when the user login as an admin. 2. The User enters admin login credentials and clicks on “Logon” button. 3. The Admin will be landed onto the Home page. 4. The Admin clicks on “Manage itineraries” option. 5. The Admin gets an option to “Add/modify stops” in the existing train route as per the request. 6. The Admin gets an option of “Manage available tickets” to manipulate such as modify number of seats/tickets available. 7. The Admin gets an option to change the price of the ticket as required. 8. The Admin gets an option to change/manipulate/modify the current route information as required. 9. The Admin clicks on “Save” to save the traveler. 10. The use case ends.   **Exceptional flow of events:**   1. The admin can disconnect , or close before signing in and doing any changes as an admin on the TrainTicket application. If this happens no itineraries can be managed information would be manipulated on the TrainTicket application. The use case ends.   **Scenarios/User stories:**   1. The Admin will get an option to view the current itinerary added by the customer in the train ticket application. 2. The Admin will be able to add/modify the stop information the current train route and can also modify the current route information. 3. The Admin will get an option to modify number of available tickets and manage the price of the available ticket as well.  * **Use Case 6: Manage user info, such as billing address, age,  name.**   **Description:**  This describes the ability of Admin to manage user’s information on the website.  **Pre-Conditions:**   1. The device must have an active network connection. 2. The device must have the application opened on the device. 3. The User must be logged in as an admin.   **Actors:**  Admin  **Flow of events:**   1. The Use case starts when the user login as an admin. 2. The User enters admin login credentials and clicks on “Logon” button. 3. The Admin will be landed onto the Home page. 4. The Admin clicks on “Users” option and further “User Profile” tab. 5. The Admin gets an option to manage user’s profile info such as name , phone number , email , password , billing address , age. 6. The Admin clicks on “Save” to save the traveler. 7. The use case ends.   **Exceptional flow of events:**   1. The admin can disconnect , or close before signing in and doing any changes as an admin on the TrainTicket application. If this happens no user information would be manipulated on the TrainTicket application. The use case ends.   **Scenarios/User stories:**   1. The Admin will get an option to view the user profile of a selected user using admin login. 2. The Admin will be able to modify the user’s profile info such as name , phone number , email , password , billing address , age using admin login. 3. The Admin will be able to update the modified details as per the validations using admin login.  * **Use Case 7: Payment management**   **Description:**  This describes the ability of Admin to manage payment configuration on the website.  **Pre-Conditions:**   1. The device must have an active network connection. 2. The device must have the application opened on the device. 3. The User must be logged in as an admin.   **Actors:**  Admin  **Flow of events:**   1. The User login as an admin. 2. The User enters admin login credentials and clicks on “Logon” button. 3. The Admin will be landed onto the Home page. 4. The Admin clicks on “Payment” tab. 5. The Admin sees the list of Payment methods. 6. The Admin selects any of the payment method among Bank checkout or PayPal express checkout to alter the same. 7. The Admin alters the details such as disable , enable , make it default, public key , private key, tokenization key , transaction type of the payment methods and click on “Save” to save the settings. 8. The use case ends.   **Exceptional flow of events:**   1. The admin can disconnect , or close before signing in and doing any changes as an admin on the TrainTicket application. If this happens no payment methods would be altered would be manipulated on the TrainTicket application. The use case ends.   **Scenarios/User stories:**   1. The Admin will be able to disable the existing payment method made by a user in the ser’s profile. 2. The Admin will be able to enable any of the new payment method listed in the user’s profile which was added by the user . 3. The Admin can set any of the payment method as default from the available choices added by a user.  **3 Component Diagram** The following illustrates the UML Component diagram modelling the major components within TrainTicket and their relations.  The various components of TrainTicket and their relationship are shown below in Figure 2.    **Figure 2: A Component diagram of the TrainTicket Application.**  The Component Model describes the entire hierarchy of components in terms of their responsibilities, their interfaces,  their relationships, and the way they collaborate to deliver required functionality. A component is a relatively independent part of a system. It is characterized by its responsibilities and eventually by the interface(s) it offers. Components can be decomposed into smaller components or composed into larger components. **4 Deployment Diagram** This section documents the UML deployment diagram for TrainTicket Application with the major parts as below:   * TrainTicket Application * Payment Server * Database Server     **A Deployment diagram of the TrainTicket Application.**  PFA the pdf as well for your reference .   **5 Conclusion**   At first glance, it may seem straightforward to design use cases , draw component and deployment diagrams ; that  is, until you actually go about implementing them. Something as simple as logging into a system can rapidly balloon into multiple branching paths as it is possible that the user may have entered incorrect credentials, completely forgot them or simply do not yet have an account.  Further complicating the whole thing are the numerous parts and their interactions that must be considered. Based on a rough high-level architecture, there are three main components; the Travelers(s)/Admin, the TrainTicket Application, and the Servers (and its accompanying database etc.). However, the TrainTicket Application consists of a diverse array of functionalities which, when added to the high-level architecture and possible interactions, results in determining components, functions, subsystems, etc.  The diagrams are somewhat versatility and comprehensibility for the programmers (who may not be accustomed to  or experienced in software design and architecture) to understand and implement the design into code.  Likewise, the simplistic language used for entities and relations should help other stakeholders understand the documentation without advanced knowledge. |

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