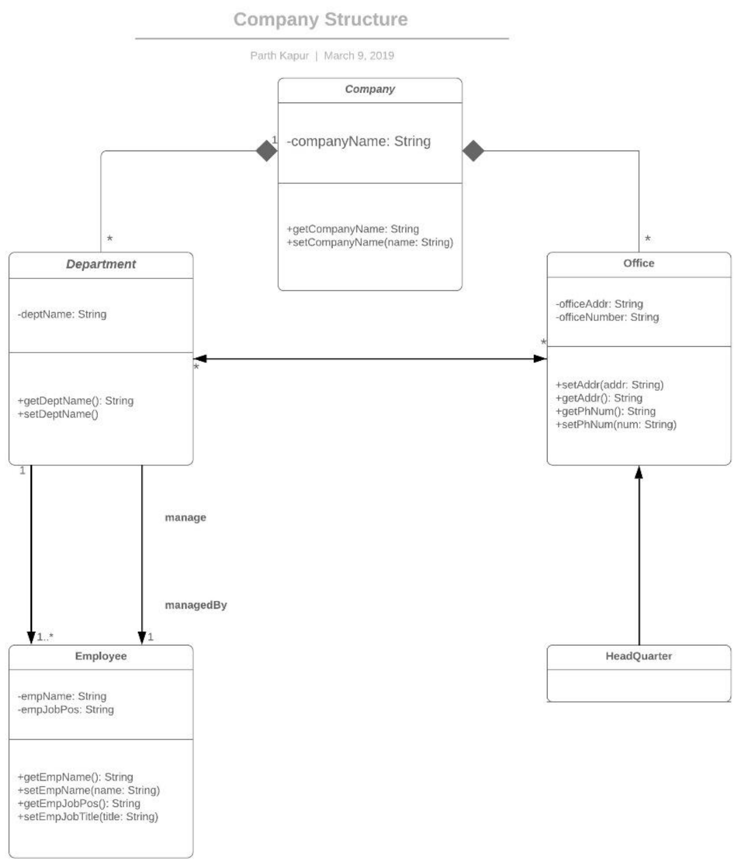
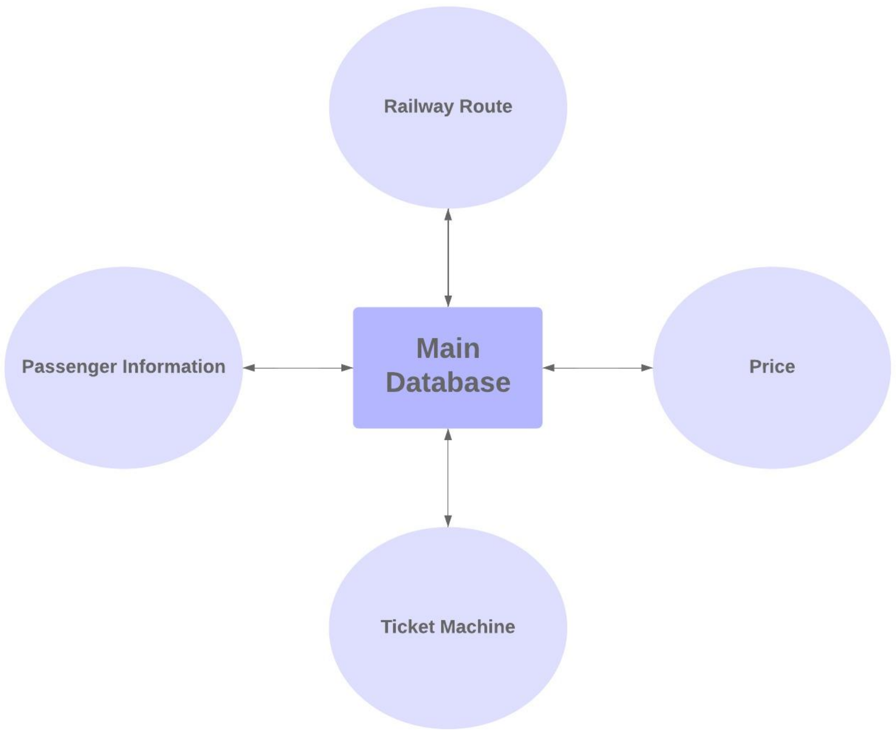
1) **A company consists of departments. Departments are located in one or more offices. One office acts as a headquarter. Each department has a manager who is recruited from the set of employees. Your task is to model the system for the company. Draw a class diagram that consists of all the classes in your system, their attributes and operations, relationships between the classes, multiplicity specifications, and other model elements that you find appropriate.**



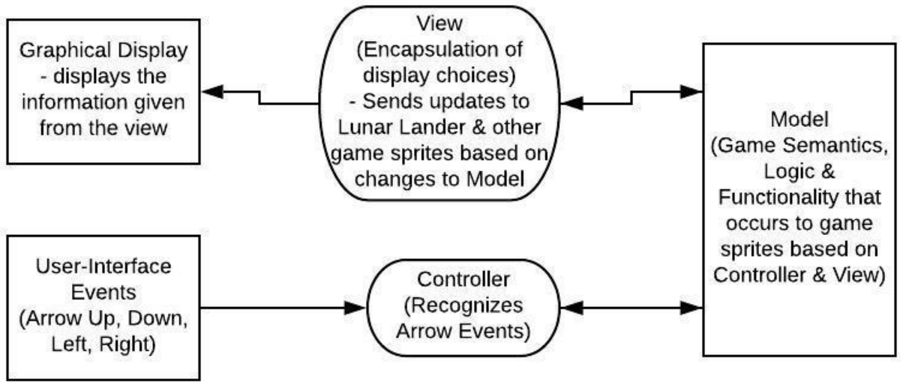
2a) **An automated ticket issuing system used by passengers at a railway station**

The architecture style known as blackboard style should be utilized. A ticket issuing system requires a central data structure (a database). Additionally, a collection of independent components which operate on this database is required. These components can include, but are not limited to, passenger information, price, ticket machine, and railway route. All these components are individually independent. However, they require being triggered by the current state of the central data structure.



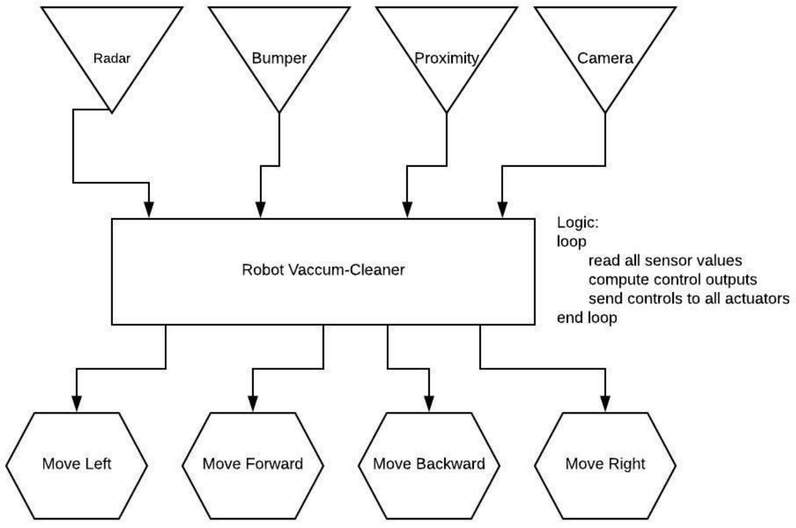
2b) **A 2D lunar lander video game. If you are not familiar with this game, search Lunar Lander Game online**

The architecture pattern known as Model-View-Controller should be utilized. Considering that is a game, the graphical display will continually change what the player (user) sees based on user inputs. The game will take these user inputs, recognize them, and manipulate the game in some shape or form. Upon completion, the view of the game will be updated and finally displayed onto the graphical display. Thus, the Model-View-Controller would be best suited for this game.


Graphical Display - displays the information given from the view
View (Encapsulation of display choices) - Sends updates to Lunar Lander & other game sprites based on changes to Model
Model (Game Semantics, Logic & Functionality that occurs to game sprites based on Controller & View)
User-Interface Events (Arrow Up, Down, Left, Right)
Controller (Recognizes Arrow Events)

2c) **A robot floor-cleaner that is intended to clean relatively clear spaces such as corridors. The cleaner must be able to sense walls and other obstructions.**

The architecture pattern known as Sense-Compute-Control should be utilized. Sense-Compute-Control is typically used in embedded real-time control applications such as robotic control. Since the floor-cleaner is a robot, the architecture pattern remains relevant. Furthermore, response needs to be quick & implicit feedback from the external environment needs to be considered. Thus, Sense-Computer-Control is the obvious choice for the architecture pattern.



```
Logic:
loop
    read all sensor values
    compute control outputs
    send controls to all actuators
end loop
```

Ridesharing Application

Parth Kapur

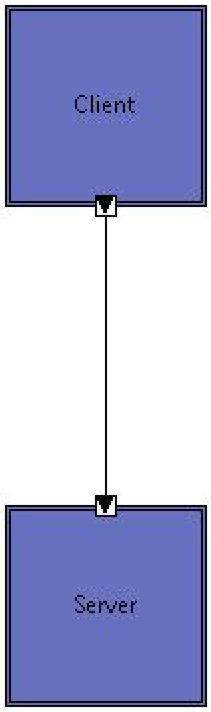
Seren Yavuz

Thomas Gorney

03/10/19

1. Introduction

The client-server model will be utilized for our ridesharing application. Client-server model is when the server hosts, delivers, and manages most of the resources to be used by client. Client-server model has one or more client that are connected to the central server over a network or internet connection. At Rideshare, our application is based on users' travel requests or offers. Within the application, users put their request/offer of their travel with details. Then, the server provides resources back to users again and matches them with other clients. Our server design and client design are explained in details below.



2. Server Design

Server Module

Purpose

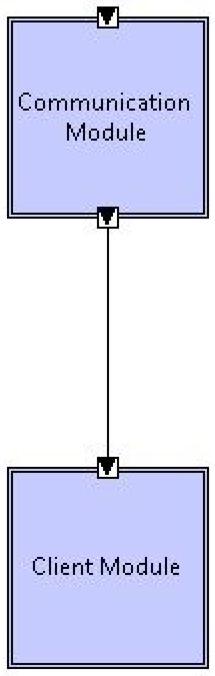
The purpose of the server module is to store, access, or change information in a centralized place.

Rationale

This module was created to create a centralized place to store user data, that can be retrieved and viewed. The server module will store things such as profile information, car information, trip information, and scheduling information.

High-Level Server Design

Considering that all users have the same functionality in terms of accessibility and privileges, the server design will mirror the high level design of the overall system.



Provided Interface

The provided interface of this module is the union between communication module and client module.

Required Interface

This module has no required interface.

2.1 Communications Module

Purpose

The communication module will provide communication services between the client module and the server. This module represents the part of the communications link that is on the server.

Rationale

This module was created to simplify communication between the clients and the server.

Provided Interface

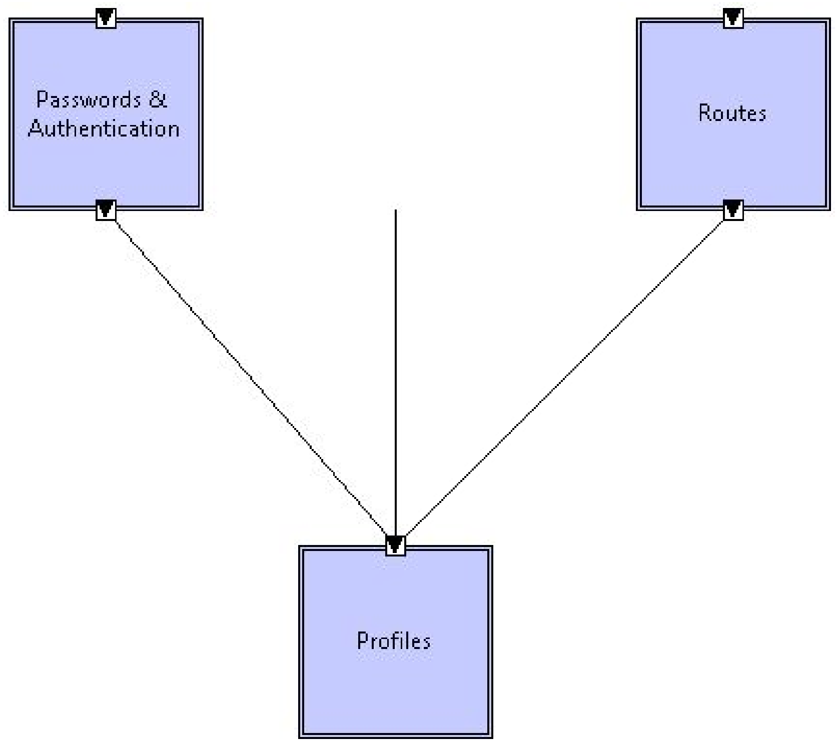
The provided interface of this module is the same as the required interface. The key difference being the interface exists for network calls, not procedure calls.

Required Interface

This module’s required interface is the union of:

- Client Module

2.2 Client Module



Purpose

The purpose of this module is to authenticate users, provide route information and profile details as well as management for these components.

Rationale

This module is created in order to create a single space to manage users server side details.

High-Level Module Design

The client module is broken down into smaller components, that can be seen as high-level modules each.

Provided Interface

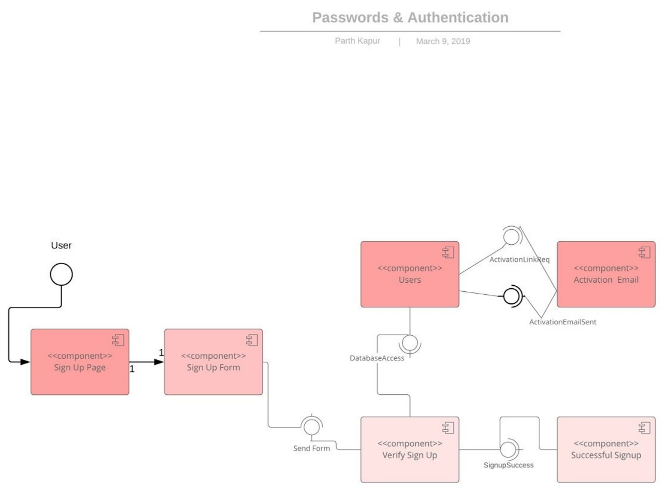
The provided interface for this module is the connections between the provided interfaces submodules.:

- passwords and authentication
- route details
- profiles submodules.

Required Interface

This module has no required interfaces.

2.2.1 Passwords & Authentication


Passwords & Authentication
Parth Kapur | March 9, 2019
User
<<component>> Sign Up Page
1
1
<<component>> Sign Up Form
<<component>> Users
ActivationLinkReq
<<component>> Activation Email
ActivationEmailSent
DatabaseAccess
Send Form
<<component>> Verify Sign Up
SignupSuccess
<<component>> Successful Signup

Purpose

The purpose of this module is to allow the user to sign up & become a registered user, thus allowing all website features to be available to the user.

Rationale

This module is created to centralize the sign in process. It will allow secure registration and data storage related to the user.

Required Interface

```
Boolean userExists(UserID userID);
Boolean emailExists(Email email);
```

Provided Interface

```
Boolean fillForm(UserID userId, Password password, Email email)
     Throws invalidFormException
```

Description:

- fillForm will take information filled by the user and validate.

Parameters:

- userID: User ID of the user whose password is being stored.
- Password: The password for the user
- Email: The email for that user

Exceptions:

- invaidFormException: If user failed to fill in form correctly.

Returns:

- Returns true if the form was filled correctly, otherwise it will return false and throw an exception.

```
Boolean activateAccount(Form formObject);
```

Description:

- activateAccount will take in a Form object and pass it to the database, which will then return a boolean if account activation was successful. Also will be used to send user to activation link page.

Parameters:

- Form: An object of Form, individual to the user who is filling form

Returns:

- Returns true if the account was successfully activated, otherwise it returns false.

```
Boolean logon(UserID userID, Password password);
```

Description:

- Validates given user/password combination without specifying which specified field is incorrect

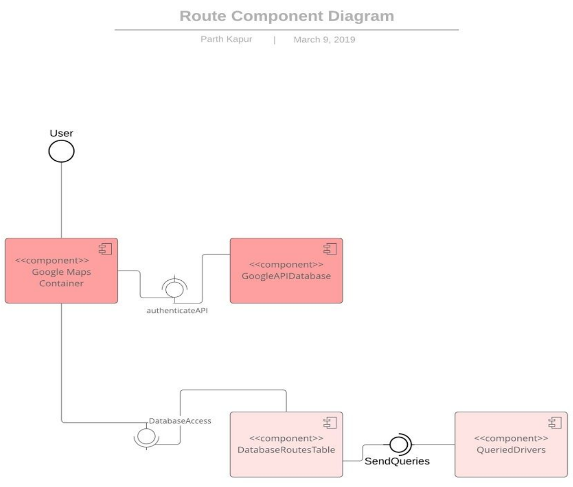
Parameters:

- userID: User ID of the user
- Password: password for that specific user

Returns:

- True if the user ID/password is correct, otherwise it will fail.

2.2.2 Routes


Route Component Diagram
Parth Kapur | March 9, 2019
User
<<component>> Google Maps Container
authenticateAPI
<<component>> GoogleAPIDatabase
DatabaseAccess
<<component>> DatabaseRoutesTable
SendQueries
<<component>> QueriedDrivers

Purpose:

The purpose of this module is to provide access to the Google Maps API embedded within the website. This API will work with both Google's API database (to ensure the API key is correct) as well as RideShare's database to query routes being offered.

Rationale:

This module is created to centralize and encapsulate route management services.

Required Interface:

```
Boolean apiIsValid(String APIKey);
```

Provided Interface:

```
String[] (string startLoc, string endLoc)
     Throws noRidesAvailableException;
```

Description:

This function will return an array of strings that will contain all the available rides in accordance to the user specifications. This array of strings will then be used to display all rides.

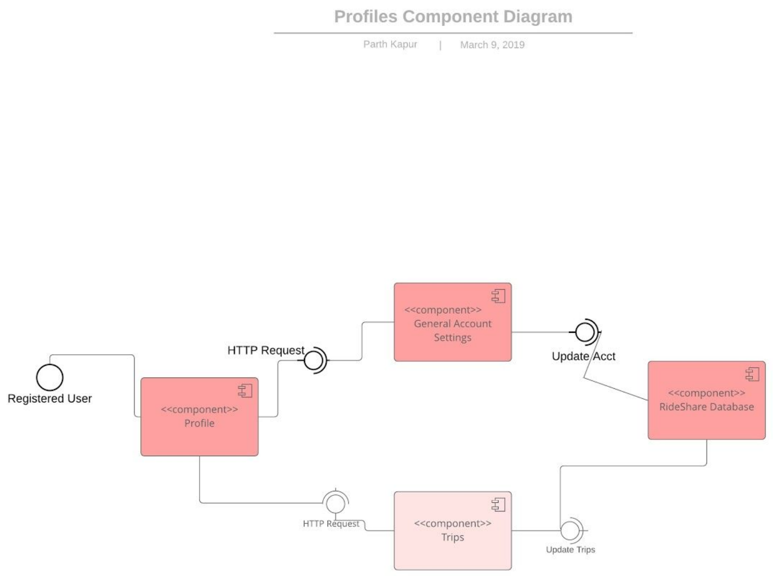
Parameters:

- startLoc: This will be the starting location specified by the user that will be converted to longitude and latitude coordinates within the function.
- endLoc: This will be the ending location specified by the user that will be converted to longitude and latitude coordinates within the function.

Exceptions:

noRidesAvailableException: Thrown if there are no rides available in accordance to the user specifications.

2.2.3 Profiles


Profiles Component Diagram
Parth Kapur | March 9, 2019
Registered User
<<component>> Profile
HTTP Request
<<component>> General Account Settings
Update Acct
<<component>> RideShare Database
HTTP Request
<<component>> Trips
Update Trips

Purpose

The purpose of this module is to allow a registered user (once logged in) to look at his or her profile, add trips or change general account settings.

Rationale

This module was created to centralize and encapsulate all user profile specific services.

Required Interface

```
Boolean logon(UserID userID, Password password);
```

Provided Interface

```
Boolean editAccount(UserID userID, Password password, Email
email);
```

Description:

This function will edit the user account settings and return a boolean once successfully (or unsuccessfully) edited.

Parameters:

userID: The userID of the user (if he has changed it).

Password: The password of the user (if he has changed it).

Email: The email of the user (if he has changed it).

Returns:

Returns a boolean if successful or not.

```
Boolean editTrips(String startLoc, String endLoc, Double price,
Int Passengers)
```

Description:

This function will edit the trips for the user if he or she wishes to provide or remove a trip he or she is offering.

Parameters:

startLoc: Starting location of the trip

endLoc: Ending location of the trip

Price: price of the trip (per passenger)

Passenger: Number of passengers allowed

Returns:

Returns a boolean if editing a trip was successful or not.

3. Client Design

Client Module

Purpose

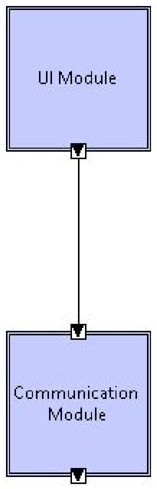
The purpose of the client module is to provide the user with an interface and functions for them to use. This is the main module that the client will interact with.

Rationale

This module was created to create a centralized place for all user functions and the user interface.

High-Level Module Design

The client module is broken down into smaller components, that can be seen as high-level modules.



Provided Interface

This module has no provided interfaces.

Required Interface

This module's required interface is the union of the UI module and the communication module.

3.1 UI Module

Purpose

The purpose of the UI module is to provide the user with a user interface that they can interact with.

Rationale

This module was created to take in user input or user data and send it to the communications module.

High-Level Module Design

This UI module is broken down into high-level modules which will consist of web pages provided in the initial report.

Required Interface

This module has no required interface.

3.2 Communication Module

Purpose

The purpose of the Communication module is to provide the means for communication between the client and the server. This module is on the client side of the communications.

Rationale

This module was created to create a centralized place for communications with the network between the client and the server.

High-Level Module Design

This Communications module is broken down into high-level module (UI module) and will pass on input from the UI module to the server.

Required Interface

This module has no required interface.