

**SINGAPORE POLYTECHNIC
SCHOOL OF ELECTRICAL & ELECTRONIC
ENGINEERING**

(ET0706) Object Oriented Programming

Project Title: Seamless Logistic Transport

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Class: DCPE/FT/3A/02

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Project Overview

This Project endeavors to develop a JavaFX Application to tailored to the needs of a logistics transportation company, mainly focused on land transportation companies.

The application establishes a user-friendly interface for administrative work and simple tasks related to their role in the company.

By incorporating a robust database system, data and information is seamlessly stored and facilitates execution of CRUD (Create Read Update Delete) operations.

Additionally, through the incorporation of an API, the program furnishes comprehensive travel details such as distance, duration, fuel consumption and fuel combustion.

System Requirements

The application is set up in IntelliJ IDEA 2022.3.2 (Community Edition).

It preferably requires:

- OpenJDK version 19.0.2
- JFoenix version 8.0.10
- MongoDB version 4.10.0 (Also requires connection to authorized wifi)
- JSON version 20210307
- API key from Google Cloud Services (Place Auto Fill & Distance Matrix)

Key Features

Streamlined Parcel Management System

This application provides a user-friendly interface for coordinators to effortlessly input parcel details and assign tasks to haulers. This efficient process ensures smooth logistics management within the delivery company.

Hassle-Free Employee Management

Administrators can conveniently add new employees to the system, facilitating seamless onboarding and maintaining an up-to-date employee database.

Integrated Database Functionality

Incorporates a robust database system, ensuring secure storage and retrieval of critical information related to parcels, employees, and task assignments.

Integration with Google API

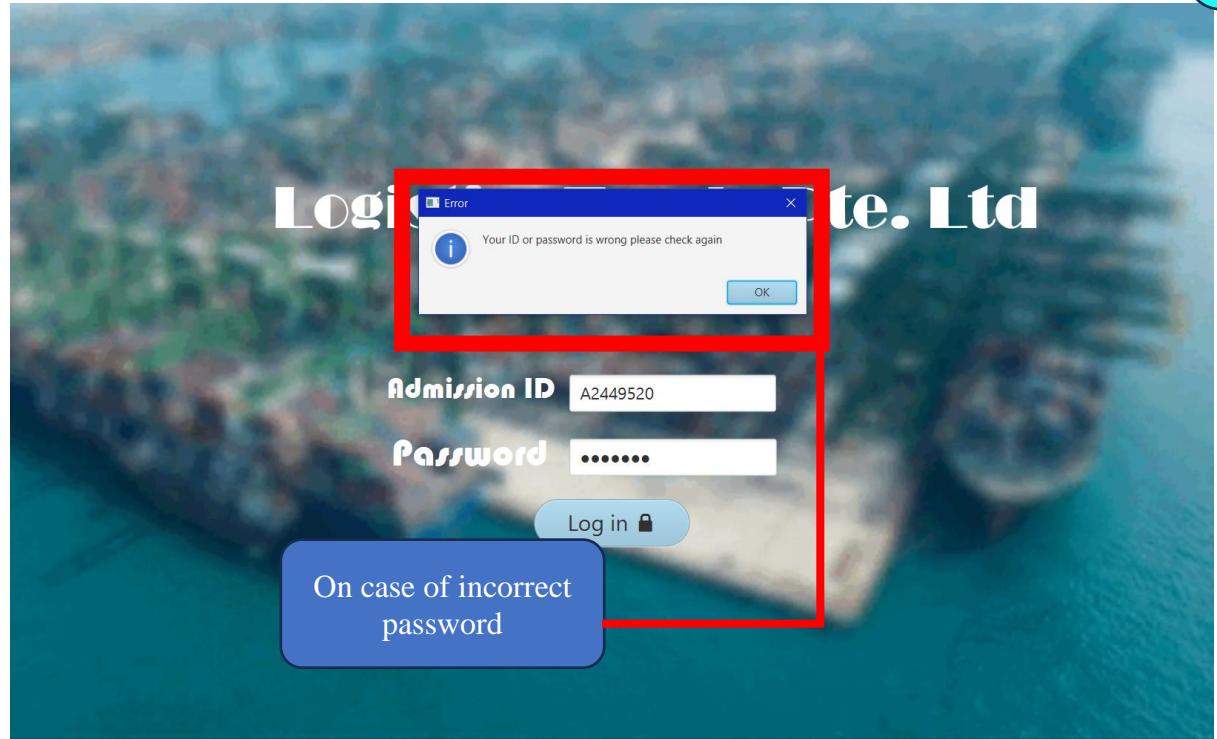
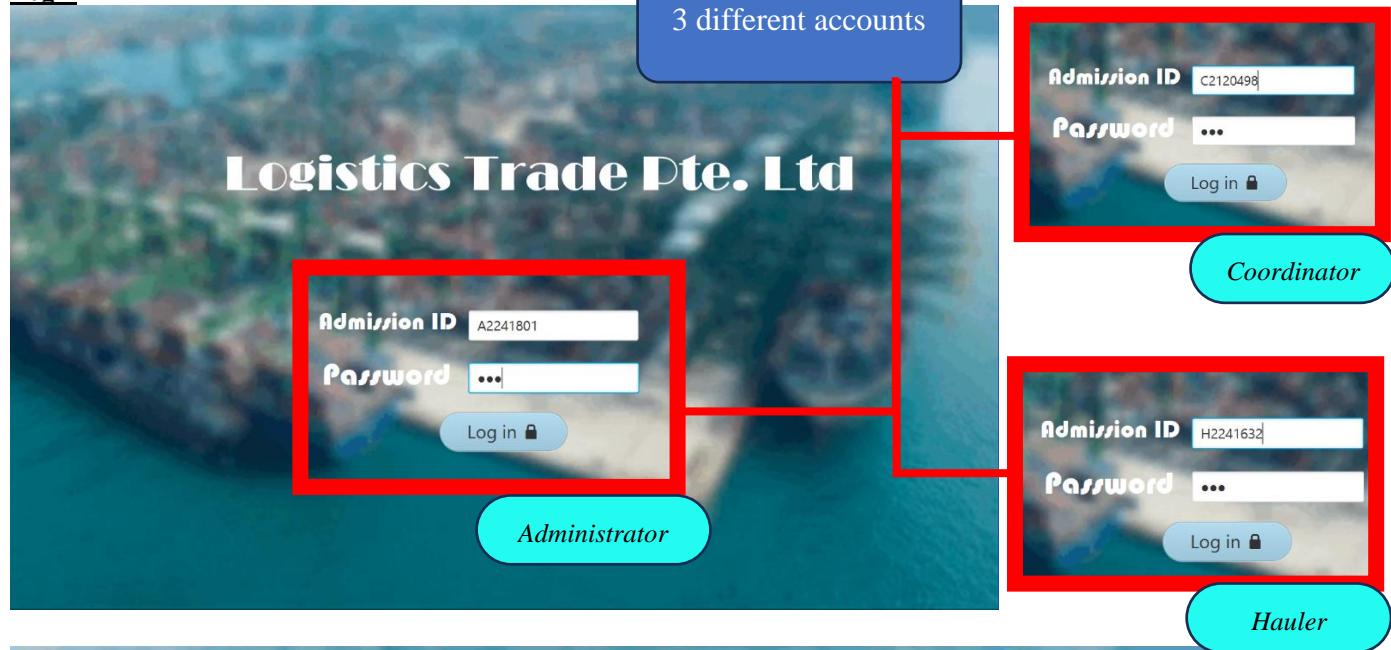
By utilizing a Google API key, the application enables automated address autofill and provides accurate duration calculations for specific locations enhancing efficiency and accuracy in delivery planning.

Together, these compelling features make the JavaFX application an indispensable tool for the logistic delivery company, streamlining operations, enhancing communication, and optimizing overall efficiency.

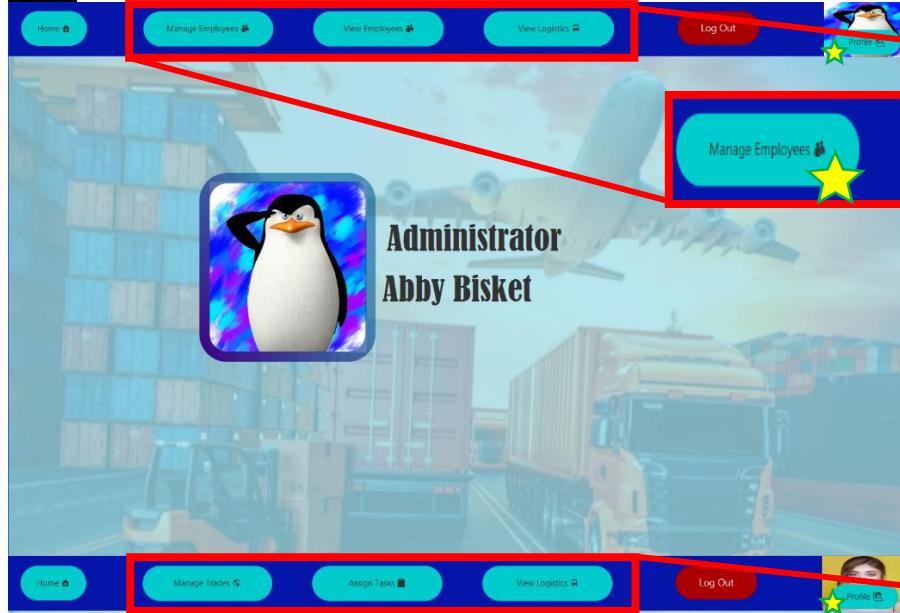
Front-End User Interface Design

Default Startup

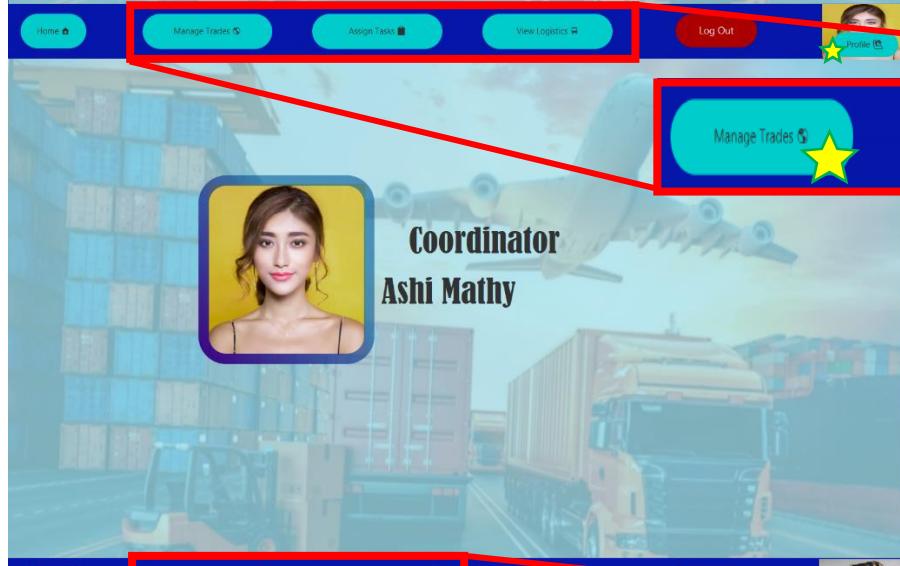
Login



Home



Please click on the stars to
navigate to respective pages

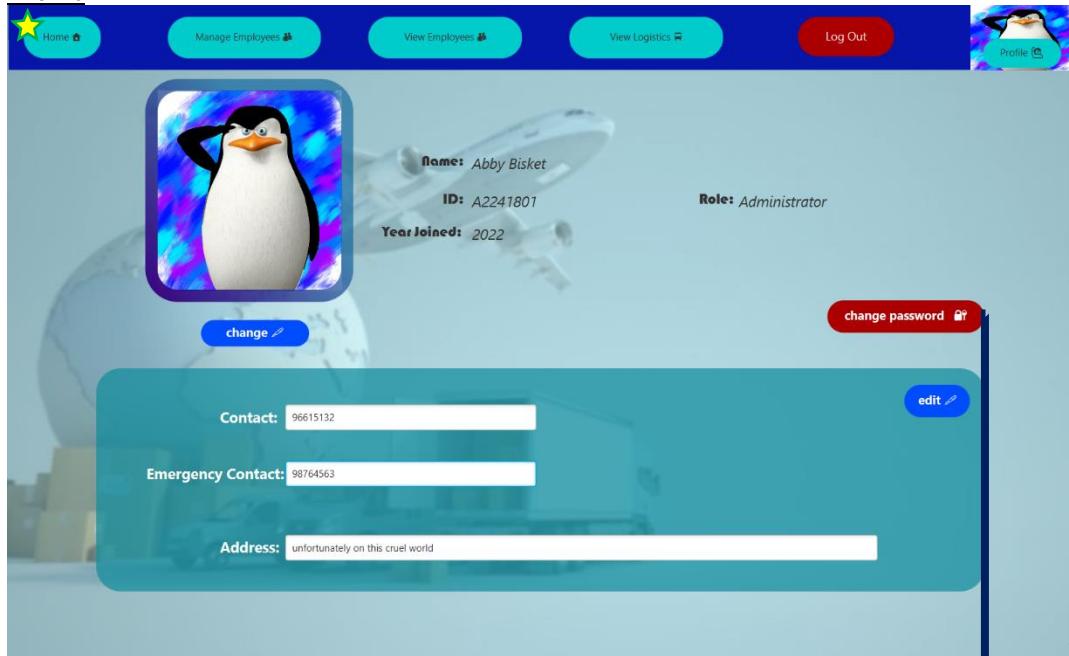


Please click on the stars to
navigate to respective pages

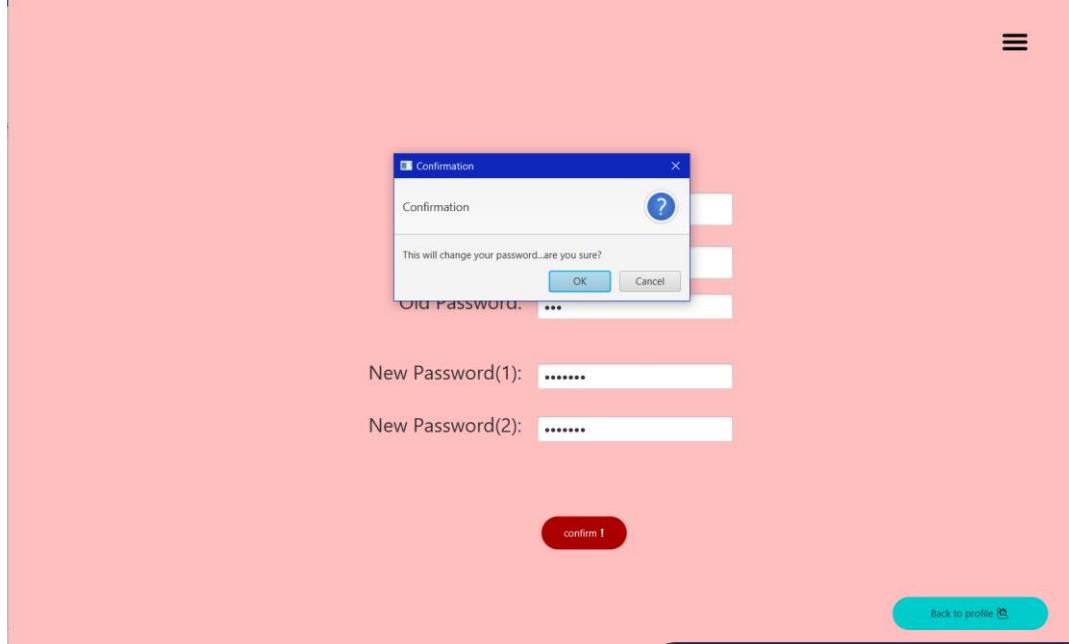


Please click on the stars to navigate to respective pages

Profile



Change Password



Before allowing user to enter password...

- there'll be credentials check,
- ensures password is correctly typed
- asks user for confirmation before officially changing

Administrator Site

Manage Employees

ID	Name	Role	Year	Tel
A2241801	Abby Bisket	Administrator	2022	96615132
C2120498	Ashi Matthy	Coordinator	2021	93836659
H2146720	Corel Jackson	Haulier	2021	98762354
C2271772	Hailey Joeseph	Coordinator	2022	90456732
C2230516	Howard Theory	Coordinator	2022	97824561
H2138274	Jake Minestone	Haulier	2021	87563402
H2012503	Lobel Petrez	Haulier	2020	87654903
H2230196	Lucas Dunphy	Haulier	2022	90234985
C2092142	Ming Yee	Coordinator	2020	98761032
H2241632	Tedooran Lawi	Haulier	2022	92950473

Employee Registration Page

Year:

Name:

Phone No:

Create Read Update Delete (CRUD)

As admin adds an employee, it gets updated in the list. When admin clicks on an employee in the list, the information gets filled in the text fields. The admin can later update information or delete information

View Employees

Name: Lobel Petrez
Role: Haulier
Year Joined: 2020
Contact: 87654903
Emergency Contact: not stated
Address: not stated

To check for an employee, admin can search for them through their ID. Their profile picture and personal details will be displayed.

View Logistics

Haulier ID	Pick Up	Drop Off	message	Status
H2241632	Yishun Avenue 2, Yishun MRT Station (NS13), Singapore	Jurong West Central 2, JurPoint Medicare, Singapore		Not Done
	Woodlands Avenue 3, Marsiling MRT Station (NS8), Singapore	Bayfront Avenue, Marina Bay Sands Singapore, Singapore		Not Done
	Yishun Avenue 11, Yishun Park Hawker Centre, Singapore	Dover Road, Singapore		Not Done
	Geylang East Avenue 1, Geylang East Public Library, Singapore	Kuala Lumpur, Federal Territory of Kuala Lumpur, Malaysia		Not Done
H2012503	Ang Mo Kio Avenue 8, Ang Mo Kio MRT Station (NS10), Singapore	PSA Terminal 2, Singapore		Not Done
	Fardabat, Haryana, India	Pörtschach am Wörthersee, Austria		Not Done
	Texas A&M University, Bizzell Street, College Station, TX, USA	Malang, Malang City, East Java, Indonesia		Not Done
	Switzer Fall Trail, Angeles Crest Highway, Yujanga, CA, USA	Dubai - United Arab Emirates		Not Done

This page is displayed to both Admin and Coordinators. This is an overview of all logistics.

Coordinator Site

Manage Trades

The screenshot shows a table of logistics tasks with columns for 'Pick Up', 'Drop Off', 'Special note', and 'Status'. The 'Drop Off' column contains several locations. A dropdown menu is open, showing a list of locations starting with 'Singapore Poly'. A yellow callout bubble says 'Implementation of API' with an arrow pointing to the dropdown.

Pick Up	Drop Off	Special note	Status
Yishun Avenue 2, Yishun MRT Station (NS13), ...	Jurong West Central 2, JurPoint Medicare, ...		Not Done
Woodlands Avenue 3, Marsiling MRT Station (NS8), ...	Bayfront Avenue, Marina Bay Sands Singapore		Not Done
Yishun Avenue 11, Yishun Park Hawker Centre, ...	Dover Road, Singapore		Not Done
Geylang East Avenue 1, Geylang East Public Li...	Kuala Lumpur, Federal Territory of Kuala ...		Not Done
Ang Mo Kio Avenue 8, Ang Mo Kio MRT Station...	PSA Terminal 2, Singapore		Not Done
Faridabad, Haryana, India	Pötschach am Worthersee, Austria		Not Done
Texas A&M University, Bizzell Street, College S...	Malang, Malang City, East Java, Indonesia		Not Done
Switzer Falls Trail, Angeles Crest Highway, Tujunga, CA, USA	Dubai - United Arab Emirates		Not Done

Pick Up: Marina Coastal Drive, Marina South Pier, Singapore

Drop Off:

- Singapore Poly
- Dover Road, Singapore Polytechnic, Singapore
- Dover Road, Singapore Polytechnic Gate 1, Singapore
- Dover Road, Singapore Polytechnic Graduates' Guild, Singapore
- Dover Road, Singapore Polytechnic Convention Centre, Singapore
- Dover Road, Singapore Polytechnic Gate 8, Singapore

add update delete

Implementation of API

CRUD operation is used here. The text fields have auto fill features so the user doesn't have to manually type all the locations

Assign Tasks

The screenshot shows a table of assigned trades with columns for 'ID', 'pick up', 'drop off', and 'status'. A dropdown menu is open, showing a list of locations starting with 'Yishun Avenue...'. A blue callout bubble says 'When the coordinator clicks on a trade on the right, it fills up the label as shown.' with an arrow pointing to the dropdown. Another blue callout bubble says 'The user can later select a hauler (in the dropdown list) to take on the task.' with an arrow pointing to the 'Select logistic location' section.

ID	pick up	drop off	status
H2241632	Yishun Avenue 2, ...	Jurong West Central 2, ...	Not Done
H2241632	Geylang East Ave...	Kuala Lumpur, Fed...	Not Done
H2012503	Ang Mo Kio Aven...	PSA Terminal 2, Si...	Not Done

Choose hauler: hauler ID

Pick up from: Yishun Avenue 11, Yishun Park Hawker Centre, Sin...

Drop off to: Dover Road, Singapore

add update remove

Select logistic location

pick up	drop off	message	status
Woodlands Ave...	Bayfront Avenue...		Not Done
Yishun Avenue...	Dover Road, Sin...		Not Done
Faridabad, Han...	Pötschach am Wor...		Not Done
Texas A&M U...	Malang, Malang C...		Not Done
Switzer Falls T...	Dubai - United A...		Not Done

When the coordinator clicks on a trade on the right, it fills up the label as shown.

The user can later select a hauler (in the dropdown list) to take on the task.

If the user wants to remove any, or update any, they are able to do so. This action will update both tasks accordingly

View Logistics

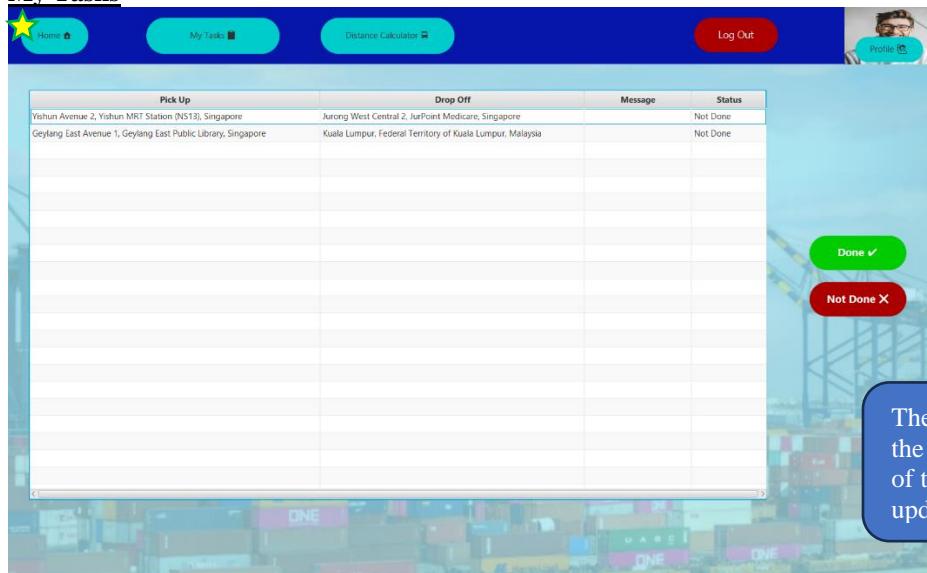
The screenshot shows a table of logistics tasks with columns for 'Haulier ID', 'Pick Up', 'Drop Off', 'message', and 'Status'. A blue callout bubble says 'This page is displayed to both Admin and Coordinators. This is an overview of all logistics.' with an arrow pointing to the table.

Haulier ID	Pick Up	Drop Off	message	Status
H2241632	Yishun Avenue 2, Yishun MRT Station (NS13), Singapore	Jurong West Central 2, JurPoint Medicare, Singapore		Not Done
	Woodlands Avenue 3, Marsiling MRT Station (NS8), Singapore	Bayfront Avenue, Marina Bay Sands Singapore, Singapore		Not Done
	Yishun Avenue 11, Yishun Park Hawker Centre, Singapore	Dover Road, Singapore		Not Done
H2241632	Geylang East Avenue 1, Geylang East Public Library, Singapore	Kuala Lumpur, Federal Territory of Kuala Lumpur, Malaysia		Not Done
H2012503	Ang Mo Kio Avenue 8, Ang Mo Kio MRT Station (NS16), Singapore	PSA Terminal 2, Singapore		Not Done
	Faridabad, Haryana, India	Pötschach am Worthersee, Austria		Not Done
	Texas A&M University, Bizzell Street, College Station, TX, USA	Malang, Malang City, East Java, Indonesia		Not Done
	Switzer Falls Trail, Angeles Crest Highway, Tujunga, CA, USA	Dubai - United Arab Emirates		Not Done

This page is displayed to both Admin and Coordinators. This is an overview of all logistics.

Hauler Site

My Tasks



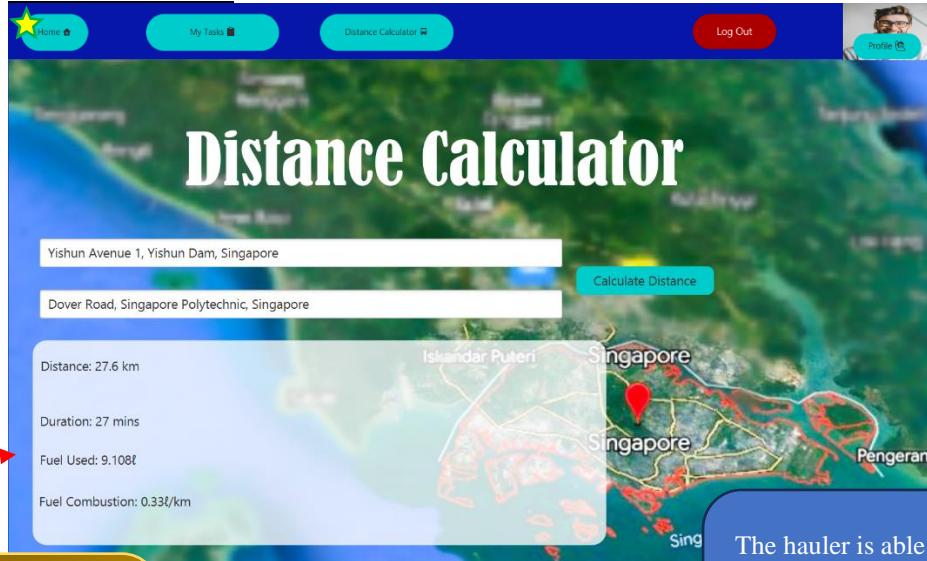
The screenshot shows a table with columns for 'Pick Up', 'Drop Off', 'Message', and 'Status'. There are two rows of data:

Pick Up	Drop Off	Message	Status
Yishun Avenue 2, Yishun MRT Station (NS13), Singapore	Jurong West Central 2, JiaPoint Medicare, Singapore		Not Done
Geylang East Avenue 1, Geylang East Public Library, Singapore	Kuala Lumpur, Federal Territory of Kuala Lumpur, Malaysia		Not Done

On the right side of the table, there are two buttons: a green 'Done ✓' button and a red 'Not Done X' button.

The hauler can view their tasks for the day. They are able to set the status of their task to let the coordinators updated of their progress.

Distance Calculator



The screenshot shows a map of Singapore with two locations marked: 'Yishun Avenue 1, Yishun Dam, Singapore' and 'Dover Road, Singapore Polytechnic, Singapore'. A callout box displays the following information:

Distance: 27.6 km
Duration: 27 mins
Fuel Used: 9.108l
Fuel Combustion: 0.33t/km

Implementation of API

The hauler is able to check the distance and duration between 2 locations.

There are calculations done to provide approximate fuel used and fuel combustion for the respective trip

Back-End

The application has 2 super classes, 2 domain classes and 12 controller classes.

The super classes are:

1) Application

It incorporates functions to create a new pages, convert base64 strings to image formats, and pop open alert boxes. This class is integrated so that the features mentioned could be executed in a single line, enhancing code flow for the programmer.

2) ConnectionToMongoDB

This class is integrated so that connection to database is only needed to be done once. The class also has functions such as to read from specific column, add data and update data in certain collections. These functions are added so that executing these features can be done in a single line in the controller classes.

The domain classes are:

1) Employees

This domain class is accessed by 'EmployeesController' where an observable list of instances of this class is created. This domain class encapsulates variables that store employee information, facilitating not only additions on but also updates or deletions.

2) Trades

This domain class is accessed by 'Trades Controller', 'AssignTasksController' and 'ViewTradesOnlyController' and '*HaulerViewTasks*'. This domain class encapsulates information of logistic trades such as the '*haulerID*', '*pickUp*', '*dropOff*', '*message*' and lastly '*status*'. The 4 controller classes create an observable list of instances of this domain class.

The controller classes are:

- 1) EmployeesController
- 2) TradesController
- 3) AssignTasksController
- 4) ViewTradesOnlyController
- 5) HaulerViewTasks
- 6) DistanceCalculatorController

This controller accesses the place auto-fill API to ease typing in the text field by auto completing user sentences and the distance matrix API to provide distance and duration details.

- 7) LoginPageController

This class accesses the database to ensure if the user id and password typed by the user is correct to allow access to assigned page.

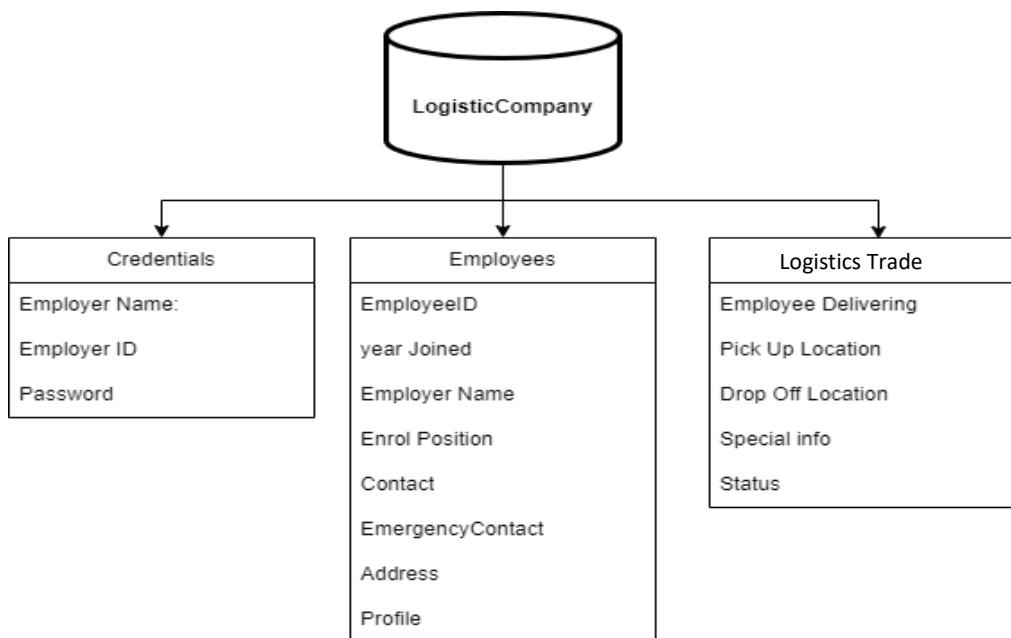
- 8) NavViewController

This class arranges the navigation bar according to the user. Options displayed and actions taken varies depending on the user. Hence this controller takes charge of these features.

- 9) ProfileController

This class access the database to display personal information of the user. These information could also be edited.

Database architecture



credentials

Storage size:	20.48 kB	Documents:	14	Avg. document size:	97.00 B	Indexes:	1	Total index size:	36.86 kB
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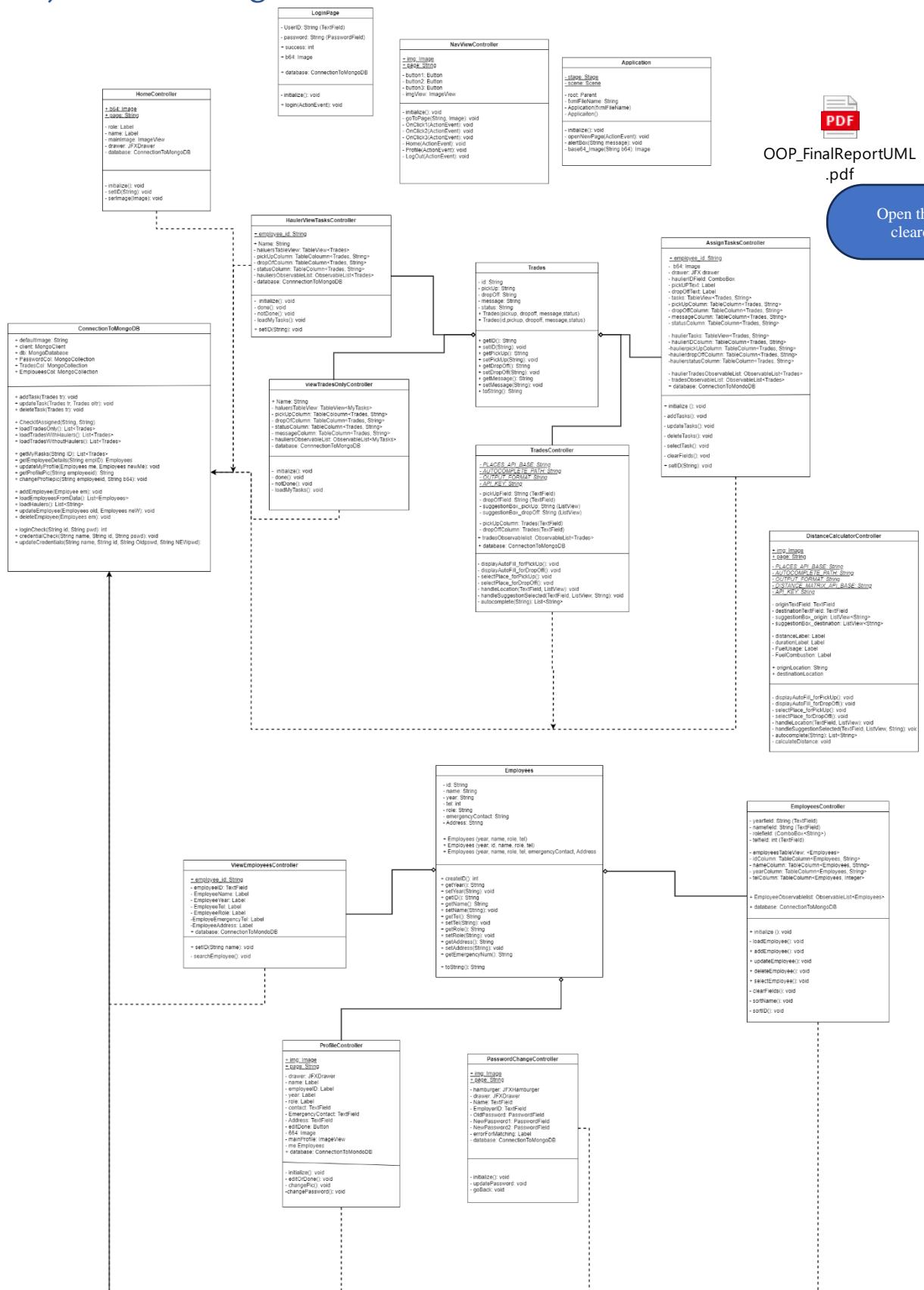
employees

Storage size:	1.38 MB	Documents:	10	Avg. document size:	129.11 kB	Indexes:	1	Total index size:	36.86 kB
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tradesLogistics

Storage size:	20.48 kB	Documents:	8	Avg. document size:	227.00 B	Indexes:	1	Total index size:	36.86 kB
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Object Class Design



Conclusion

I was pleased to realize I managed to create all the features I mentioned in the concept paper and was also able to add additional features on the final project. Embarking on this project has been a profound learning experience that vividly demonstrated Object-Oriented Programming (OOP) concepts. By integrating a database and effectively implementing CRUD operations, I gained valuable insights into data management and persistence. Adding and understanding the distance matrix API and the Place auto-fill API not only showcased the power of API utilization but also enriched my experience. Creating this application honed my skills in creating a well organized and maintainable code. Overall, this endeavor underscored the significance of structured programming, efficient data handling, and strategic API integration, enhancing my proficiency as a developer and problem solver.

Resource

- Flowchart and Object Class Diagram
 - <https://app.diagrams.net/>
 - <https://www.youtube.com/watch?v=UI6lqHOVHic>
- MongoDB database
 - <https://www.baeldung.com/java-mongodb>
 - https://www.tutorialspoint.com/mongodb/mongodb_java.htm
- Google Distance Matrix API & Google Place Auto Fill API
 - <https://developers.google.com/maps/documentation/places/android-sdk/autocomplete-tutorial>
 - <https://console.cloud.google.com>
 - <https://youtu.be/dFhKVJcmADo>
- Basics of JavaFX
 - https://youtu.be/9XJicRt_FaI
- CSS
 - <https://youtu.be/o-lAsVuskKI>