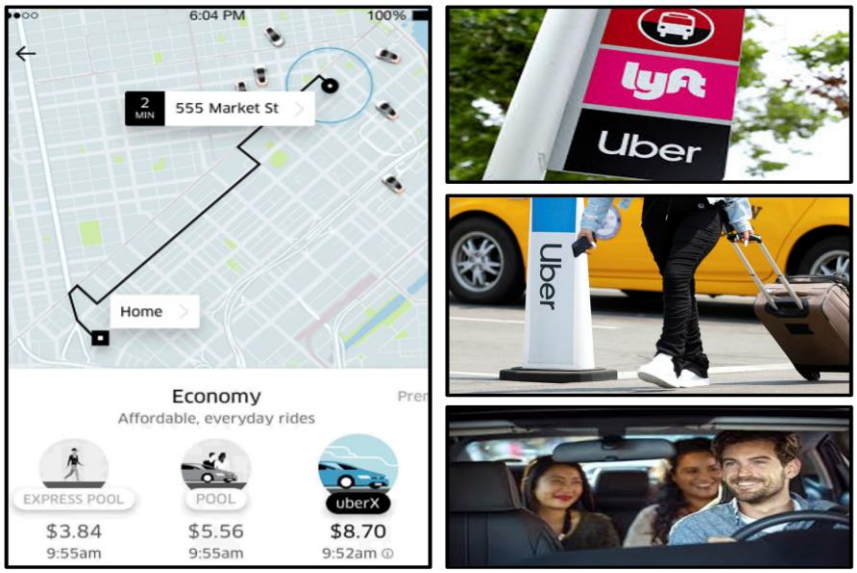
SOFTWARE REQUIREMENT SPECIFICATION (Version 0.9)

Mobility Sharing Platform

Software Platform for Sharing Mobility with Vehicles



June 2022

DUE DATES

	Scope of AD	Due Date	Length Limit
Interim Report	Chapters 1~4	6/30(Th), 9pm	30± Pages
Pre-Final Report	Chapter 5	7/10(Sun), 9pm	50± Pages
Final Report	Chapters 6~7	7/25(Mon), 9pm	70± Pages

CEP INSTRUCTOR

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Mobility Sharing Platform

1. Purpose of the Document

The purpose of this document is to specify the requirement for developing the target system in this CEP. The requirement will become the basis for designing the software architecture of a target system, which is required as a fulfillment to acquire the Samsung Associate Architect (AA) certification.

2. Comprehensive Evaluation Project (CEP)

2.1. About Associate Architect (AA) Program

Associate Architect Program of Samsung Electronics is to provide participants with two sets of software architecture design proficiency.

- **Body of Knowledge (BoK) on Software Architecture**

  This set includes the fundamental theories and methods for designing SW architecture

- **Skillset for Designing SW Architecture**

  This set includes the practical skill for applying architecture design methods to a given SRS.

CEP is designed to fulfill the second set of AA program through an individual design project.

2.2. How is the CEP problem prepared?

The CEP problem is prepared by the instructor, based on the following principles.

- **Principle 1. Utilizing the Whole BOK of Software Architecture Design**
  - Utilizing Architecture Styles
  - Designing Architecture for multiple Views
  - Designing Architecture for Non-Functional Requirements
- **Principle 2. Handling the Complexity of Industrial Systems**

  The target system to design in CEP is an industry-level complex software system, i.e., not an academic problem appeared in books or literature.

- **Principle 3. Solution Not Available in Public**

  CEP problem is not a reproduction of already existing exercise problem in books, and hence the architecture design solution for the CEP problem is not available in public.

2.3. Architecture Design Reports in CEP

Each participant designs and submits the design of software architecture for the target system in incremental manner.

- Interim Report
  This report includes the context analysis model and the skeleton architecture design of the target system.
- Prefinal Report
  This report includes the architecture design for multiple views of the system; functional view, information view, behavior view, and deployment view.
- Final Report
  This report includes the architecture design for non-functional requirements and the validation of the architecture design.

❑ **Weight Distribution of CEP Reports**

Interim Report	Prefinal Report	Final Report	TOTAL
30 points	30 points	40 points	**100 points**

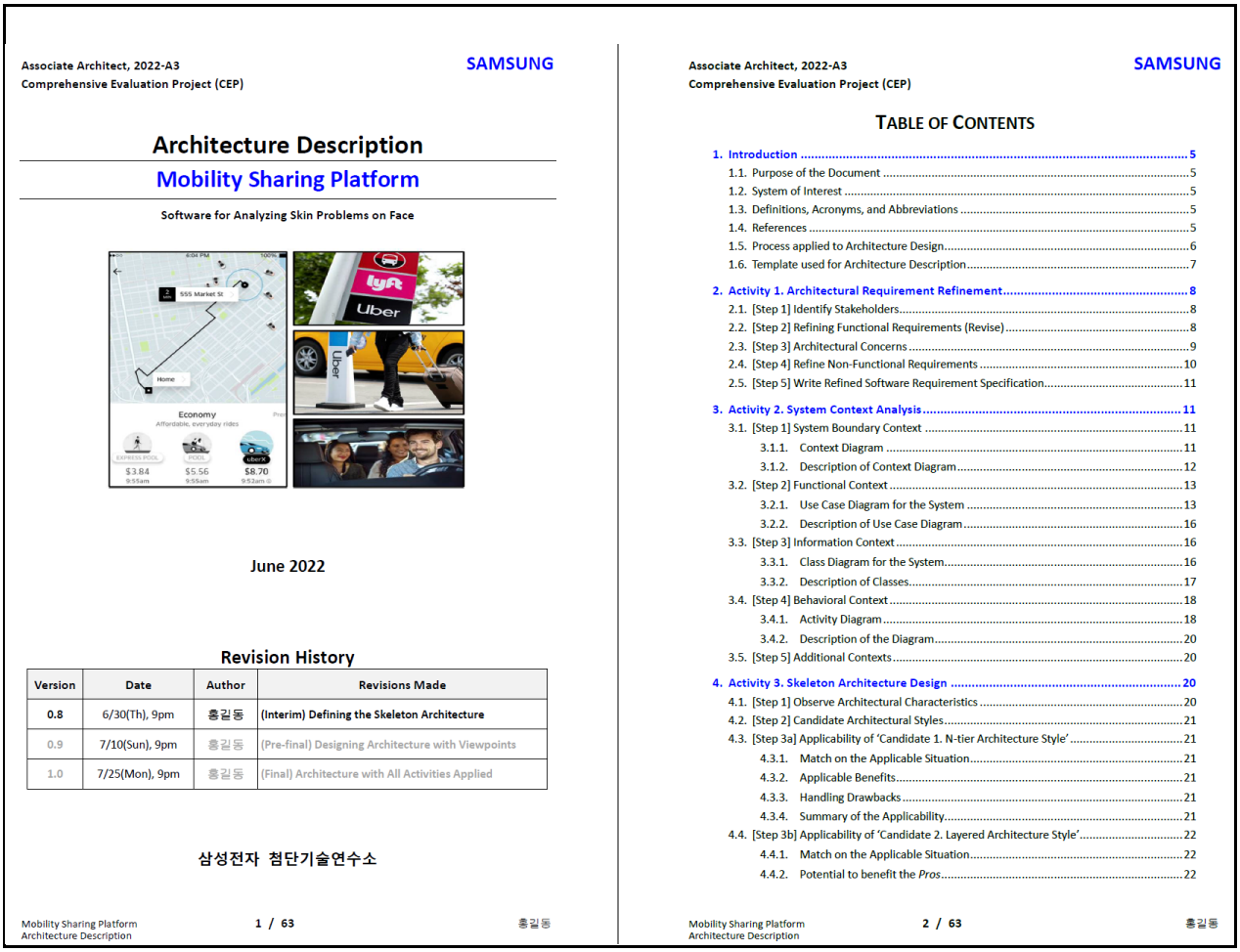
2.4. Template for Architecture Design

A template for designing the software architecture in CEP is provided and hence participants can utilize the template in specifying the architecture design. The template is devised to be consistent with the architecture design methodology provided by the instructor.

❑ Filename

AA-2022-A3, CEP, AD Template.docx

❑ Table of Contents for CEP Report



Associate Architect, 2022-A3
Comprehensive Evaluation Project (CEP)
SAMSUNG

Architecture Description

Mobility Sharing Platform

Software for Analyzing Skin Problems on Face

June 2022

Revision History

Version	Date	Author	Revisions Made
0.8	6/30(Th), 9pm	홍길동	(Interim) Defining the Skeleton Architecture
0.9	7/10(Sun), 9pm	홍길동	(Pre-final) Designing Architecture with Viewpoints
1.0	7/25(Mon), 9pm	홍길동	(Final) Architecture with All Activities Applied

삼성전자 첨단기술연수소

Mobility Sharing Platform
Architecture Description
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홍길동

Associate Architect, 2022-A3
Comprehensive Evaluation Project (CEP)
SAMSUNG

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3. Overview of the Target System

3.1. What is Sharing Economy?

The sharing economy is an economic model defined as a peer-to-peer (P2P) based activity of acquiring, providing, or sharing access to goods and services that is often facilitated by a community-based online platform [Wikipedia 2022.06]

Examples of Sharing Economy services are the followings.

- Sharing Car: Liftshare
- Renting between individuals, Shared Transport Vehicles: Uber
- Sharing Housing amongst Individuals: Airbnb

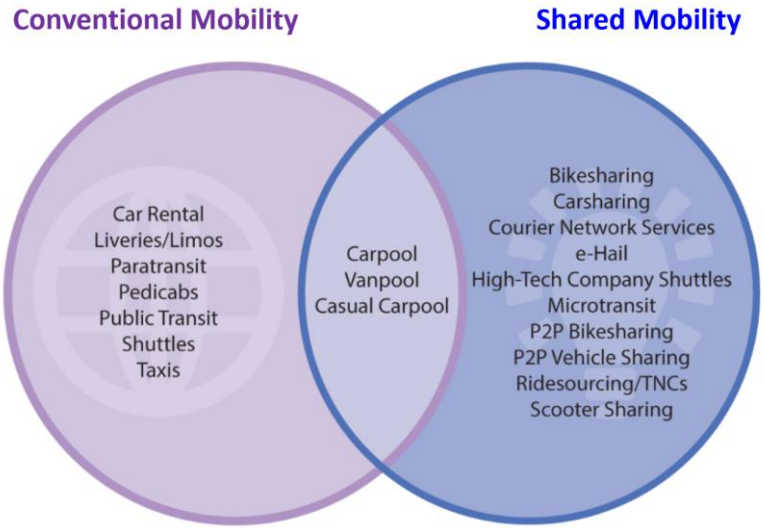
Sharing economy aims to provide values and benefits both to sharing providers and sharing consumers.

3.2. What is Shared Mobility?

Shared Mobility is a transportation system where travelers share a vehicle either simultaneously as a group or over time as personal rental, and in the process share the cost of the journey, thus creating a hybrid between private vehicle use and mass or public transport.

The shared use of a motor vehicle, aircraft, drone, delivery vehicle, bicycle, scooter, or other mode is an innovative transportation paradigm that enables users to gain short-term access to transportation or goods on an “as-needed” basis.

- **Trend of Shared Mobility**



3.3. What is Mobility Sharing Platform?

The target system for this CEP, *Mobility Sharing Platform*, is a software platform that provides a common set of functionalities required to operate shared mobility business operation such as Uber and Lift.

The following figure shows the designated places for picking up riders of Uber and Lift.

As a software platform, the design of the *Mobility Sharing Platform* should capture a common set of core functionalities required in operating mobility sharing businesses. Also, the platform should be designed to support the variability among various mobility sharing business.

3.4. Process of Sharing Mobility

The process of sharing the mobility is defined as a sequence of the following tasks.

- **A rider requests a cab service with departure, destination, date and time, people travelling, and baggage to carry.**
- **The system reviews the serviceability of the request.**
- **If not serviceable, inform the rider. Otherwise, perform the remaining tasks.**
- **The system generates an optimal route from the departure and the destination. And, it computes the estimated time to arrival (ETA) and the cost for the sharing.**
- **The system asks the rider to accept the cost and terms for a contract.**
- **Upon acceptance, the system finds and informs the request to a group of candidate drivers.**
- **Drivers may elect to accept the request.**
- **The system chooses the most appropriate driver among the candidate drivers.**
- **The system informs and asks to confirm the rider and the driver with the contract.**
- **Upon the conformations from the rider and the driver, the system keeps monitoring the locations of the rider and the driver's vehicle.**

- **The system performs a Transport Session by performing the sequence of following tasks.**
  - Managing the Arrival of Vehicle to the rider's location.
    The driver goes to the specified place to pick the rider.
    - Monitoring and Informing
    - Messages and Calls
  - Checking the completion of seating and the departure.
  - Managing the transportation and notifying the progress.
    - Realtime Monitoring of the Location
    - Realtime Update of the Arrival Time
  - Checking the completion of the arrival and leaving the vehicle.
  - Asking the rider to leave any change of the fare and the amount of an optional tip.
  - Processing the payment of fare with the pre-registered credit card of the rider.
- **The system informs the rider and the driver with the completion of the Ride Service Session.**

3.5. Benefits of the System

The benefits of the system are summarized as the following.

- **Benefits to Riders**

  Riders can utilize a transport service at convenient and cost-effective ways. The fare for shared transport is considerably lower than the fare of traditional taxi services.

  - Convenience
  - Low Cost

- **Benefits to Drivers**

  Drivers can establish an addition source of generating income with any significant investment. The drivers typically utilize their vehicles and work only for the days and time period of their choices.

  - Source of Income
  - Flexible Hours of Work

- **Benefits to Sharing Service Provider**

  The business operators, i.e., the service providers such as Uber and Lift, charge a nominal service fee for each Transport Session. And, the business operator may acquire a stable user base.

  - Source of Business Income
  - User Base

3.6. Deployment of the Target System

The Mobility Sharing platform is to be utilized as an underlaying infrastructure on which various mobility sharing service applications can be built. Therefore, the typical deployment of such application would include the following system nodes.

- **Mobile App for Riders**
- **Mobile app for Drivers**
- **Application for Staffs who operate Mobility Sharing Service applications.**
- **Service System that maintains the master data repository and provides the common services to the Application for Staffs.**
  - The server system should interact with the credit card processing systems for ride fares.

4. Functional Requirements

The functionality of the system is classified into the following functional categories.

4.1. Rider Registration

This functionality is to manage the profiles of riders who request ride services and pay for the provided services. The rider profile includes the information for identification, house and location, and credit card used for fare payments.

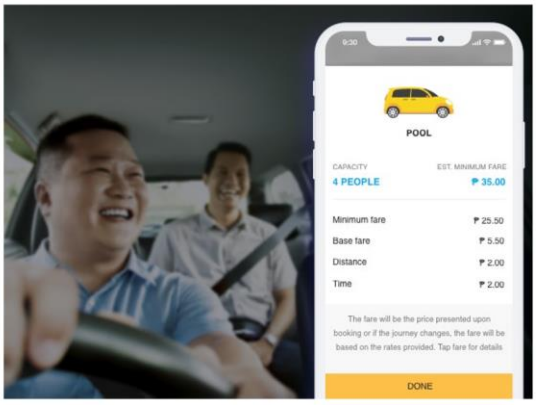
4.2. Driver Registration

This functionality is to manage the profiles of drivers who provide taxicab services to riders. The driver profile includes the identification information, driver license information, and the information of the vehicle shared.

4.3. Staff Registration

This functionality is to manage the profiles of staffs who operate and manage the system. The staff profile includes the identification information and the occupation-related information.

The following figure shows three types of the system users.



Driver Rider

Staffs

4.4. Vehicle Profile Management

This functionality is to manage the information of vehicles used by drivers. The profile includes the description of the car type, license plate number, capacity for riding, baggage space, safety features. A driver may operate more than one vehicles for providing ride services.

4.5. Map and Traffic Management

This functionality is to manage the information of the maps used and the real-time traffic information used for computing the travel routes and time.

The Mobility Sharing Platform does not maintain its proprietary maps; rather, it relies on third-party services for the map datasets. Similarly, the platform does not maintain its own traffic information system; rather, it relies on public or private realtime traffic information services. Therefore, the platform will have inevitable dependences on the external map and traffic services.

On the other hand, the system should be designed not to depend too much on a specific map and traffic service providers; rather, the system should be designed to accommodate various sources for acquiring the map and traffic information.

- **Utilizing Map Services**

  The target system uses maps for the following operations.

  - Finding and displaying the location of the rider
  - Finding and displaying the locations of candidate vehicles.
  - Projecting all potential routes from a departure to a destination
  - Showing the current location during Trip Sessions

- **Traffic Services**

  The target system uses traffic services for the following operations.

  - Displaying the realtime traffic conditions on the routes from a departure to a destination such as the areas of traffic congestion, car accidents, and road repair service
  - Finding the most optimal transport route from a departure to a destination by considering the traffic condition
  - Updating the estimated time to arrive by reflecting dynamically evolving traffic conditions.

4.6. Trip Request Management

This functionality is to let riders request a new trip. The trip request includes the following descriptive attributes.

- Departure Place

  The default is the current location of the rider, but it can be changed to any specific location for a departure.

- Destination Place

  The target place or a location where the rider wishes to go.

  We do not consider the multiple stops for simplicity in this CEP.

- Departure Time

  The departure date and time.

- Travel Group

The number of the riders and any special assistance required

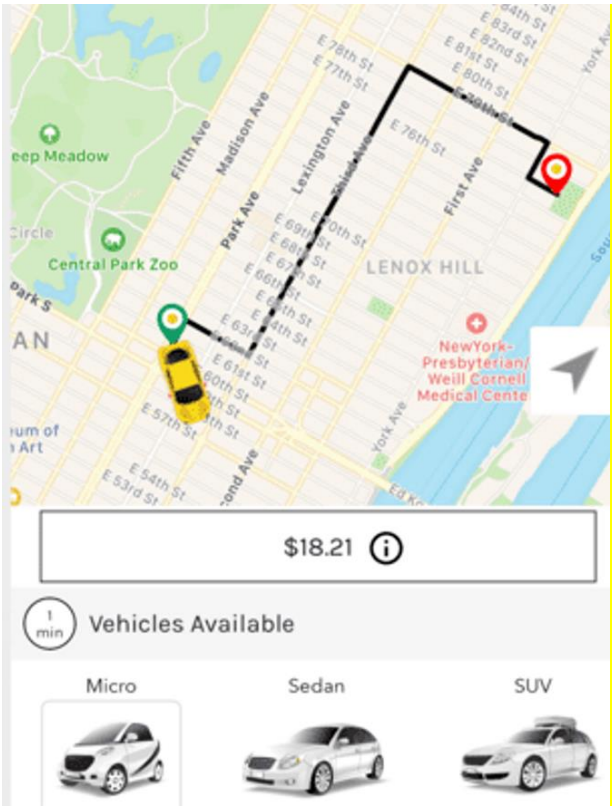
- Baggage
  The number and size of baggage
- Any other requirements

Once a Trip Request is entered, the system checks for the validity of the request. If the trip request is not serviceable, the system informs the rider.

4.7. Trip Contract Management

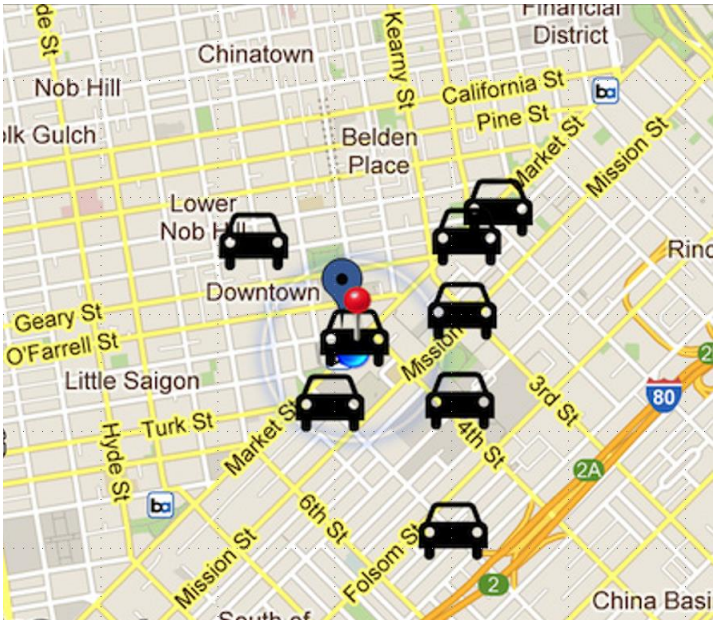
This functionality is to manage the Trip Contract between riders and drivers. When a rider submits a Ride Request, the system reviews the serviceability of the request. If serviceable, the system determines the best route for the trip and computes the cost and time for travelling. Then, the system asks the rider to choose available ride options and accept the cost and terms for the Trip Contract.

The following figure shows an example of a contact made with Uber service.



It shows the departure, the destination, the route, the computed fare with the default option, and the available ride options such as choosing a vehicle type. The selected options could update the fare.

Once the rider accepts the contact, the system locates the set of nearby drivers, as shown in the following figure.



And, the system broadcast the Ride Contract to the drivers. When multiple drivers accept the contract within the given period of time, and then the system chooses the most appropriate driver among candidate drivers.

Then, the system informs the rider with the details of the driver, the vehicle, and the estimated time to arrive at the departure location for the pick-up. At this moment, the Ride Contact is finalized.

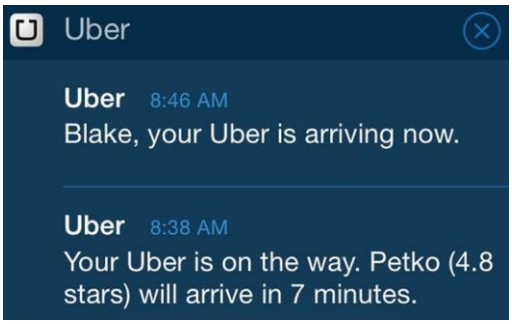
4.8. Trip Session Management

A trip session includes all the activities between the time a Trip Contact is made to the time the vehicle arrives at the destination the rider leaves the vehicle. This functionality of Trip Session Management is to acquire and store all the activities for each Trip Session.

During a Trip Session, the system keeps monitoring and displaying the location of the vehicle and the activities occurred during the session. The essential activities that are included in each Trip Session are the followings.

- **Arrival of Uber for Pickup**

  The arrival for pickup is monitored in realtime and stored in the session, as shown in the following figure.



- **Updating the Current Location**

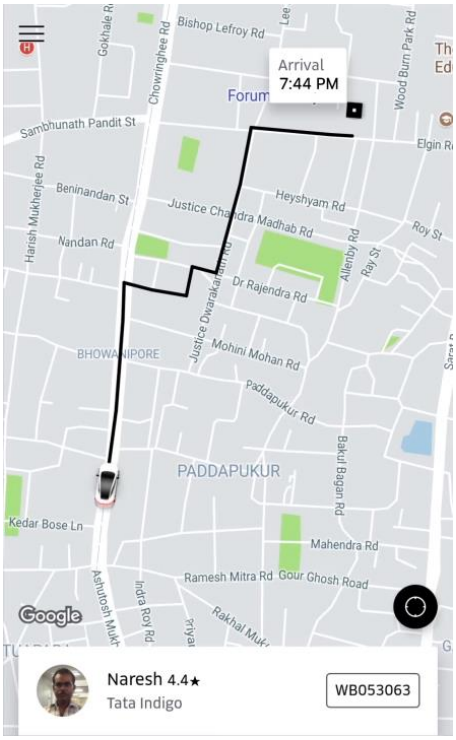
  The current location of vehicle is monitored and displayed on the mobile apps of riders and drivers.

- **Monitoring Traffic Condition**

  The traffic condition at the current location is acquired and displayed on the apps.

- **Updating the Arrival Time**

  The estimated time to arrive at the destination is updated as the vehicle moves, and the traffic condition gets changed. And, the updated estimated time is displayed on the map, as shown in the following figure.



- **Modifying the Trip Route**

  As the traffic condition may evolve due to the accident, congestion, and any unforeseen causes, the system keeps trying to generate better routes on demand. Then, the system suggests a new route and asks the driver and/or rider to accept it. If accepted, the new route is applied.

- **Arrival at the Destination**

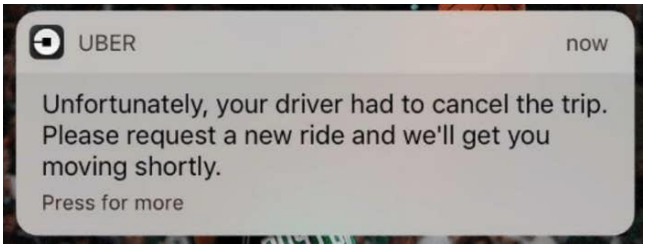
  The arrival at the destination is monitored and the system asks the rider to confirm the completion of the arrival. The system also asks the user to leave a review on the ride experience.

4.9. Trip Issue Management

This functionality is to maintain the history of handing ride-related issues raised by riders or drivers. Typical types of issues are the followings.

- **Cancelling a Trip**

  A Trip Contract may be cancelled by either a rider or a driver.



- **Aborting Trip Session**

  A trip session could be terminated before the successful arrival at the destination for various causes.

  - Due to the change of mind by the rider
  - Due to the mechanical problems of Vehicle
  - Due to an Accident
  - Due to bad weather
  - Due to medical conditions of the rider or the driver

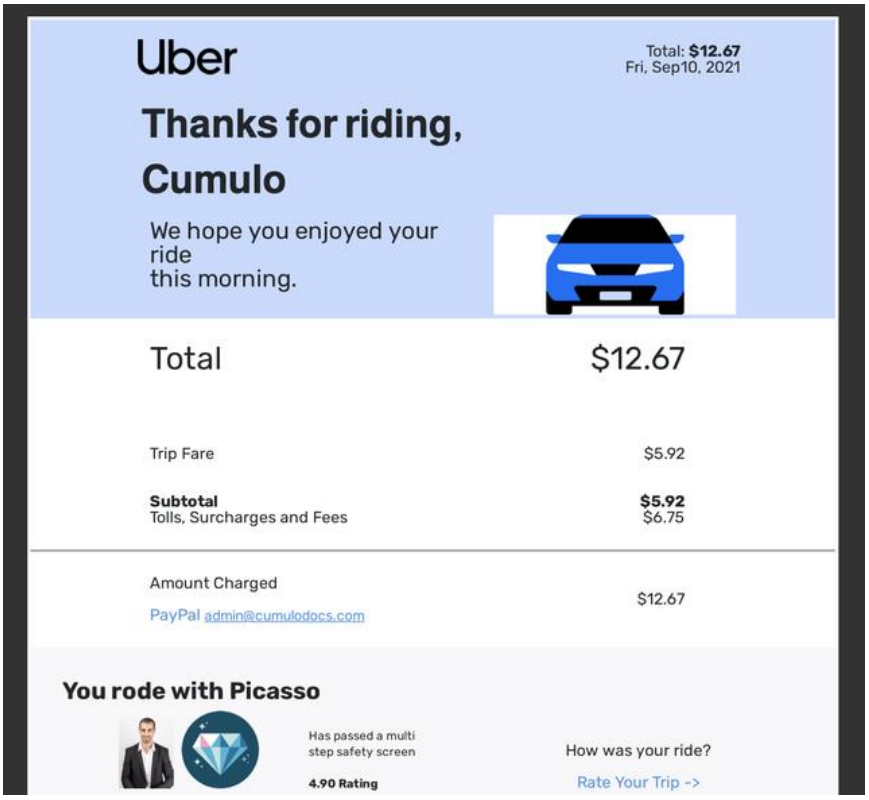
- **Complains**

  A complaint could be made by the rider or the driver such as;

  - Misbehavior of Rider or Driver such as Smoking
  - Rude Driving
  - Lack of Cleanness of Vehicle
  - Asking a direct tip in cash

4.10. Fare Management

This functionality is to compute the fare amount and an optional tip by riders, and process the payment with the given credit card information. It display the details of the total charges as shown in the following figure. Therefore, there is no direct payment of fare from riders to drivers.

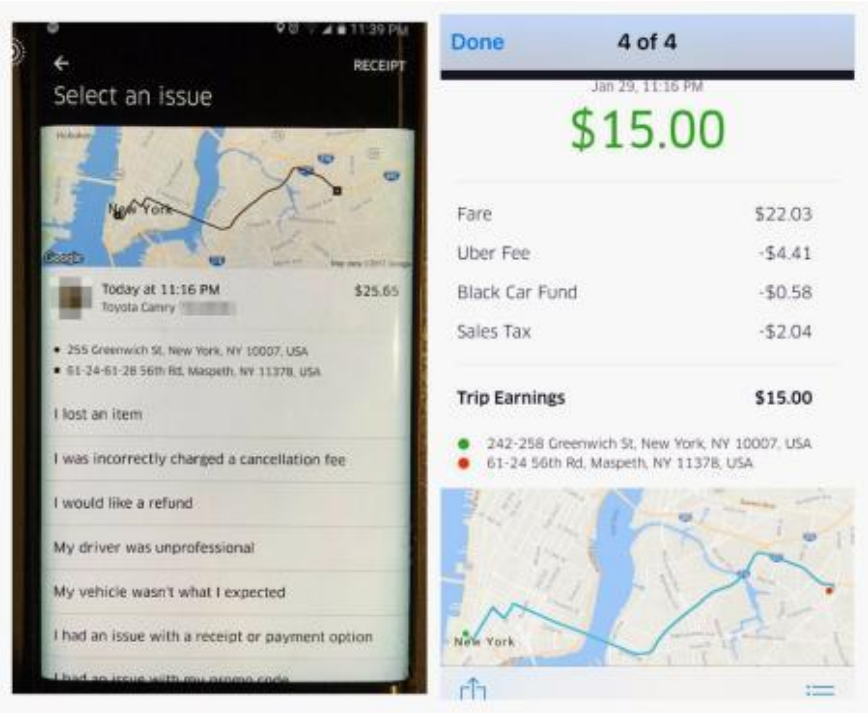


4.11. Wage Management

This functionality is to compute and process the wages for drivers who provided ride services. The wage payment period is initially set to a month, but it can be changed by the service providing company.

The main source for determining the wages is the history of providing ride services. The company deducts a platform service fee for each ride service. The actual amount of wage payments is the amount after tax withholdings.

The following figure shows an example of computing a wage for a Trip Session.



4.12. Report Generation

This functionality is to generate business transaction reports in various forms. Pre-specified reports are periodically generated monthly, quarterly, and/or yearly. Reports can also be generated on demand.

5. Non-Functional Requirements

There can be several non-functional requirements that are essential in the target system. For CEP, we consider only 2 NFR items.

5.1. NFR-1. High Accuracy of Route Planning

Mobility Sharing Platform should be designed to provide a high level of accuracy in generating the optimal route for rides. The route for a given Trip Session is defined as the sequence of roads to travel from a departure location to the destination, and the characteristics of being optimal are specified by riders.

The set of quality characteristics for the route are given here.

- **Route with Shortest Travel Time**

  This type of routes delivers the shorted travel time, which will yield a faster time to arrive at the destination. The route may not be the optimal for other aspects such as toll fee, high gas due to a longer total travel distance.

- **Route with Lowest Toll Fee**

  This type of routes costs the least amount of toll fees among candidate routes. Hence, this route is planned by avoiding highways, bridges, or tunnels with a toll fee. The route may not yield the shorted travel time for the sake of a low toll fee.

- **Route with Comfortable Roads**

  This type of routes consists of roads that are comfortable to drive. Such roads can be highways, well-paved straight roads, less traffic lights, less speed bumps, less curves and slopes. The route may results in a longer travel time and a high toll fee for the sake of comfortable travel.

- **Can be other characteristics in the future**

  There can be other types of characteristics for route planning in the future.

5.2. NFR-2. High Availability of the Services

Mobility Sharing Platform should be designed to provide a high availability of services to riders and drivers. The availability is essential in this platform due to the intensive interaction between the client apps and the server, and the realtime dynamic updates of current locations, time to travel, and traffic situations.

Since the platform can potentially be utilized by various mobility sharing service providers, any failure of the platform could yield significant business risks to the service operators.

The availability is determined by the degree of avoiding the system failures, being tolerant on faults, and the efficiency of recovering the software and its datasets upon a failure.

6. Guidelines for Conducting CEP

6.1. Guidelines for Designing the Architecture

Apply the following guidelines for writing CEP Reports.

- **Conformance to the given SRS**

  The submitted AD should conform to the given SRS.

- **Conformance to UML Standards**

  The submitted AD should conform to the notational and usage standards of UML.

- **Consistency among various Artifacts in AD**

  There should be a high consistency among various artifacts (such as diagrams) in the submitted AD.

- **Comprehensibility of Textual Description**

  The textual elaboration of the architecture design should be written in accurate, precise, and condensed way. Hence, the understandability of the AD becomes high. The textual description can be written in English, Korean, or their mixture.

- **Readability of Figures and Tables**

  The figures and tables should be easily readable by applying good formats, right font size and special effects on them. For example, a use case diagram with 100 use cases should be well structured and enlarged if needed.

- **Reasonable Details of Machine Learning design**

  The submitted AD would include a design for managing machine learning models. The description of the machine learning model generation should be written in reasonably details. The description typically includes machine learning algorithms utilized, training sets used, the details for designing the model generation components.

- **Originality of the AD**

  The submitted AD should be an individual work. Any same or highly similar solutions would get a score penalty.

6.2. Guidelines for Submitting Reports

Apply the following guidelines for writing CEP Reports.

❑ **Due Dates for Submission**

The due dates and times for each CEP report are specified. The CEP reports should be submitted by the due. Late submissions of CEP reports are not accepted.

❑ **Format of the CEP Report**

Use the word processor, MS Word, for formatting your CEP reports. Submit the word files, not the PDF files.

❑ **Submission**

Submit your CEP report to the course manager, not to the instructor.

6.3. Evaluation Form for CEP Reports

The following form is used to evaluate the CEP report.

Evaluation of CEP Report

Name: 홍길동

Criteria	Max	Earned
Ch.1, Introduction	2	2
Ch.2, (A1) Architectural Requirement Refinement	2	2
Ch.3, (A2) System Context Analysis		
System Boundary Context	3	3
Functional Context	5	5
Information Context	5	5
Behavior Context	5	5
Ch.4, (A3) Skeleton Architecture Design		
Justification of Candidate Architecture Styles	6	6
Integrating Selected Styles into Architecture	2	2
Ch.5, (A4) Architecture with Views		
Applying Functional Viewpoint	8	8
Applying Information Viewpoint	8	8
Applying Behavior Viewpoint	8	8
Applying Deployment Viewpoint	6	6
Ch.6, (A5) Architecture with Quality-driven Design		
Design for NFR #1, Applying Process	8	8
Design for NFR #1, Quality Delivered	7	7
Design for NFR #2, Applying Process	8	8
Design for NFR #2, Quality Delivered	7	7
Ch.7, (A6) Architecture Evaluation		
Intermediate Steps of applying Evaluation	6	6
Correctness of the Evaluation	4	4
CEP Score	100	100

❑ **Strength**

❍

❑ **Weakness**

❍