

# Software Design Specification for Bicycle Sharing System

Prepared By:

Mst.Solaimi Hamid (346)  
Umma Sumaiya Jahan (351)  
Mamunur Roshid (371)  
Mohammad Rokibul Hassan Shanto (400)  
Md.Mahfuzur Rahman (404)

*Department of Computer Science and Enginerring  
Jahangirnagar University, Dhaka*

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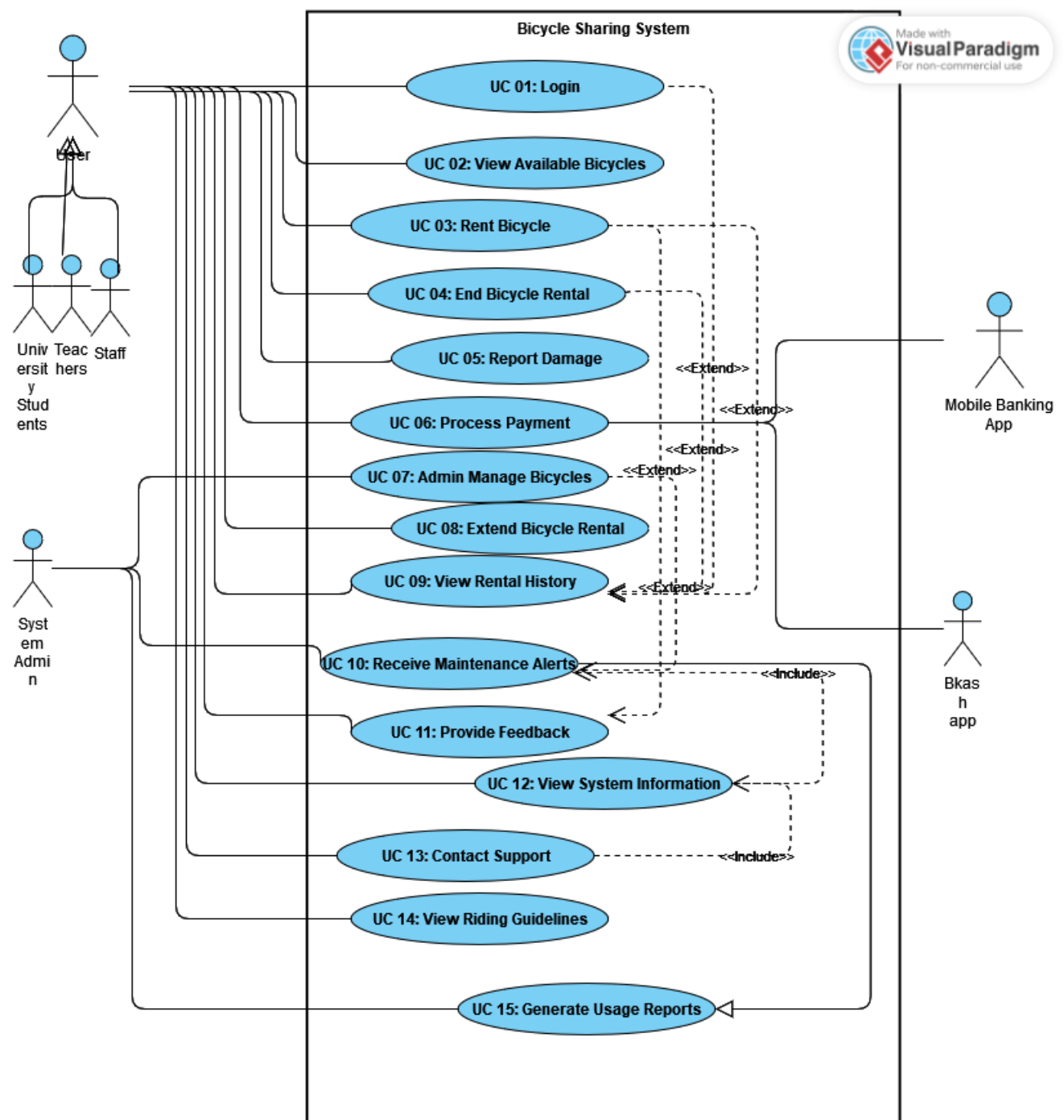
# Revision History

Revision	Date	Author(s)	Description

## Chapter 1

# Use Case Specification

## 1.1 Use Case Diagram



## 1.2 Use Case Specification

**Use Case ID:** UC01

**Use Case Name:** Login

**Actor:** University Students, Teachers, Staff

**Description:** This use case describes the process of logging into the bicycle sharing system using the institutional ID card. The users provide their ID card information for authentication.

**Exception:**

1. If the provided ID card information is invalid, the system displays an error message.
2. If the user's account is locked due to repeated incorrect attempts, the system prompts the user to contact support.

**Precondition:**

1. The user must possess a valid institutional ID card.

**Post Condition:**

1. The user gains access to the system and can interact with various functionalities.

**Use Case ID:** UC02

**Use Case Name:** View Available Bicycles

**Actor:** University Students, Teachers, Staff

**Description:** This use case allows users to view the real-time availability of bicycles on a geomap within the university campus. Users can identify nearby bicycles that are available for rental.

**Exception:**

1. If there is a technical issue with fetching the bicycle availability data, the system displays an error message.

**Precondition:**

1. The user is logged into the system and has access to the geomap functionality.

**Post Condition:**

1. The user is presented with a geomap displaying the locations of available bicycles.

**Use Case ID:** UC03**Use Case Name:** Rent Bicycle**Actor:** University Students, Teachers, Staff**Description:** This use case involves the process of renting a bicycle within the university campus. Users can locate available bicycles on the geomap, scan the bicycle's barcode to start the rental session, and initiate the rental payment.**Exception:**

1. If the selected bicycle is already rented by another user, the system notifies the user and provides alternative options.
2. If the user's payment method fails, the system prompts the user to update their payment information.

**Precondition:**

1. The user is logged into the system and is at a location with available bicycles.

**Post Condition:**

1. The user successfully starts a bicycle rental session, and the system begins charging based on the hourly rate.

**Use Case ID:** UC04**Use Case Name:** End Bicycle Rental**Actor:** University Students, Teachers, Staff**Description:** This use case describes the process of ending a bicycle rental session. When users reach their destination, the system automatically locks the bicycle and calculates the total rental cost.**Exception:**

1. If the user tries to end the rental session before the minimum rental time, the system prompts the user to continue the rental or charges a penalty.

**Precondition:**

1. The user is in the middle of an active bicycle rental session.

**Post Condition:**

1. The user's bicycle rental session ends, and the system displays the total rental cost.

**Use Case ID:** UC05**Use Case Name:** Report Damage**Actor:** University Students, Teachers, Staff**Description:** This use case involves reporting intentional damage to a rented bicycle. Users can notify the system about any damages they discover during the rental session.**Exception:**

1. If the reported damage is assessed to be due to normal wear and tear, the system informs the user that they are not held accountable.
2. If the user reports false damages repeatedly, the system may restrict their access.

**Precondition:**

1. The user is in the middle of an active bicycle rental session.

**Post Condition:**

1. The system logs the reported damage and user information for further investigation and accountability.



**Use Case ID:** UC06**Use Case Name:** Process Payment**Actor:** Mobile Banking App, Bkash App**Description:** This use case involves the process of processing the payment for a bicycle rental session. The system interacts with the chosen mobile banking app (such as Bkash) to complete the payment transaction.**Exception:**

1. If the payment transaction fails due to technical issues or insufficient funds, the system prompts the user to retry or update payment details.

**Precondition:**

1. The user has completed a bicycle rental session and is ready to make the payment.

**Post Condition:**

1. The payment is successfully processed, and the user receives a payment confirmation.

**Use Case ID:** UC07**Use Case Name:** Admin Manage Bicycles**Actor:** System Admin**Description:** This use case involves administrative actions related to managing the bicycles in the system. The admin can add new bicycles, remove damaged bicycles, and maintain the overall bicycle inventory.**Exception:**

1. If the admin tries to remove a bicycle that is currently rented, the system displays a warning and requires confirmation.

**Precondition:**

1. The system admin is logged into the admin interface.

**Post Condition:**

1. Bicycle inventory is updated according to the admin's actions.

**Use Case ID:** UC08**Use Case Name:** Extend Bicycle Rental**Actor:** University Students, Teachers, Staff**Description:** This use case allows users to extend the duration of their ongoing bicycle rental session. Users can choose to prolong their rental time and are charged accordingly.**Exception:**

1. If the user's account balance is insufficient to cover the extended rental cost, the system prompts the user to make a payment.

**Precondition:**

1. The user has an active bicycle rental session that is nearing its end.

**Post Condition:**

1. The user's bicycle rental session is extended, and the system recalculates the rental charges based on the extended duration.

**Use Case ID:** UC09**Use Case Name:** View Rental History**Actor:** University Students, Teachers, Staff**Description:** This use case allows users to view their past bicycle rental history, including rental dates, durations, and costs.**Exception:**

1. If there are no rental records for the user, the system displays a message indicating no rental history.

**Precondition:**

1. The user is logged into the system and wants to access their rental history.

**Post Condition:**

1. The user is presented with a summary of their past bicycle rental sessions.

**Use Case ID:** UC10**Use Case Name:** Receive Maintenance Alerts**Actor:** System Admin**Description:** This use case involves the system sending maintenance alerts to the admin regarding bicycles due for maintenance based on usage and time. The admin is notified to ensure timely maintenance.**Exception:**

1. If the admin's contact information is outdated or inaccessible, the system logs the notification failure.

**Precondition:**

1. The system has recorded bicycles that require maintenance based on usage and time thresholds.

**Post Condition:**

1. The admin is informed about bicycles due for maintenance to facilitate timely upkeep.

**Use Case ID:** UC11**Use Case Name:** Provide Feedback**Actor:** University Students, Teachers, Staff**Description:** This use case allows users to provide feedback or rate their rental experience through the app. Users can share comments, suggestions, and ratings.**Exception:**

1. If the user submits feedback without any content, the system prompts the user to provide meaningful feedback.

**Precondition:**

1. The user has completed a bicycle rental session and wants to provide feedback.

**Post Condition:**

1. The user's feedback is submitted and may be used for system improvement.

**Use Case ID:** UC12**Use Case Name:** View System Information**Actor:** University Students, Teachers, Staff**Description:** This use case enables users to access system announcements, maintenance schedules, promotions, and other relevant information.**Exception:**

1. If the system information is unavailable due to technical issues, the user receives a notification.

**Precondition:**

1. The user is logged into the system and wants to access system-related information.

**Post Condition:**

1. The user is presented with relevant system announcements and information.

**Use Case ID:** UC13**Use Case Name:** Contact Support**Actor:** University Students, Teachers, Staff**Description:** This use case allows users to initiate a support request through the app for assistance with issues or queries related to the bicycle sharing system.**Exception:**

1. If the support request is submitted without providing any details, the system prompts the user to provide more information.

**Precondition:**

1. The user wants to seek assistance or clarification regarding the bicycle sharing system.

**Post Condition:**

1. The user's support request is submitted, and the support team is notified.

**Use Case ID:** UC14**Use Case Name:** View Riding Guidelines**Actor:** University Students, Teachers, Staff**Description:** This use case allows users to access guidelines for safe and responsible riding within the university premises. Users can view information on recommended routes, traffic rules, and other riding guidelines.**Exception:**

1. If the riding guidelines are not available due to technical issues, the system displays an error message.

**Precondition:**

1. The user is logged into the system and is looking for information on safe bicycle riding.

**Post Condition:**

1. The user can access and review the riding guidelines to ensure safe and responsible riding practices.

**Use Case ID:** UC15

**Use Case Name:** Generate Usage Reports

**Actor:** System Admin

**Description:** This use case allows the admin to generate reports showing bicycle usage patterns, popular routes, peak usage times, and other usage-related insights.

**Exception:**

1. If the generated report data is incomplete or inaccurate, the admin is informed to review the report criteria.

**Precondition:**

1. The admin wants to gather information about the usage trends and patterns in the bicycle sharing system.

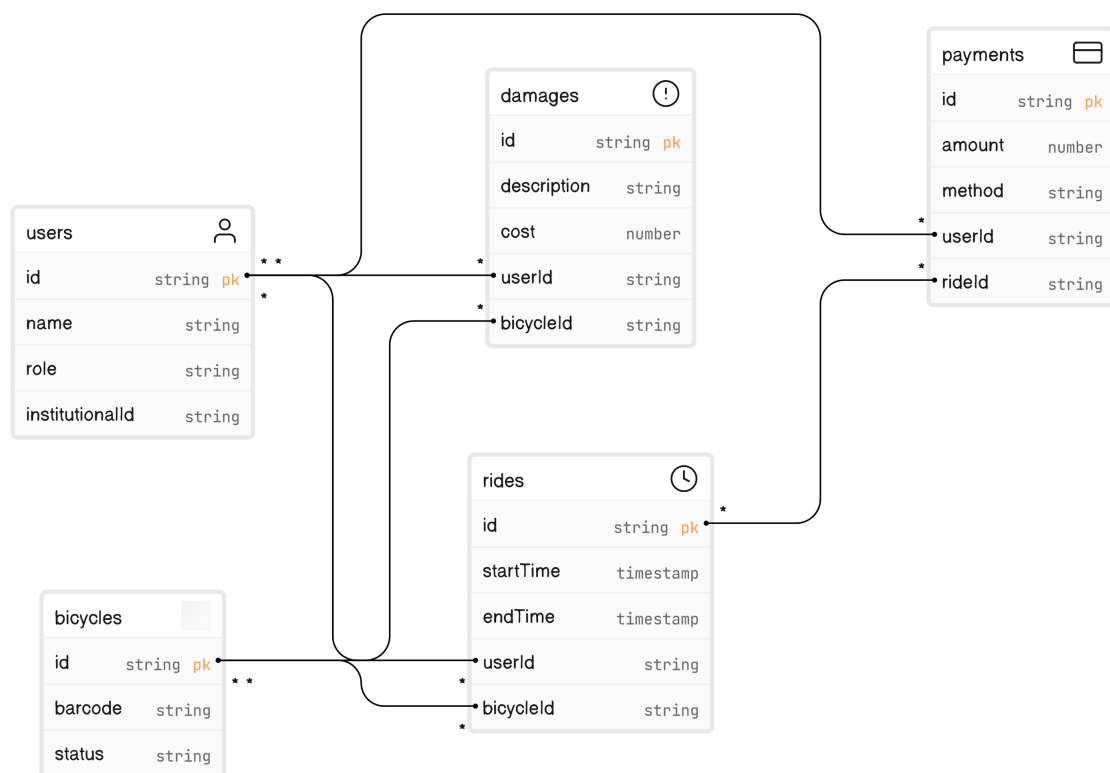
**Post Condition:**

1. The admin receives a comprehensive usage report that aids in making informed decisions.

## Chapter 2

# Class Diagram

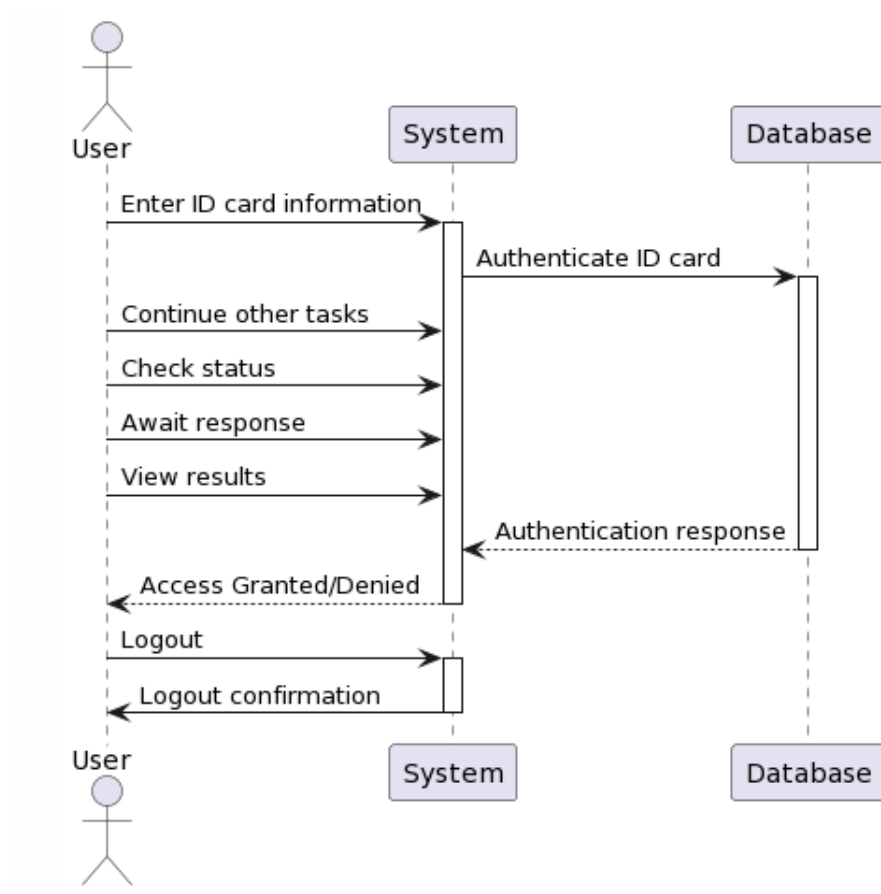
### 2.1 Class Diagram



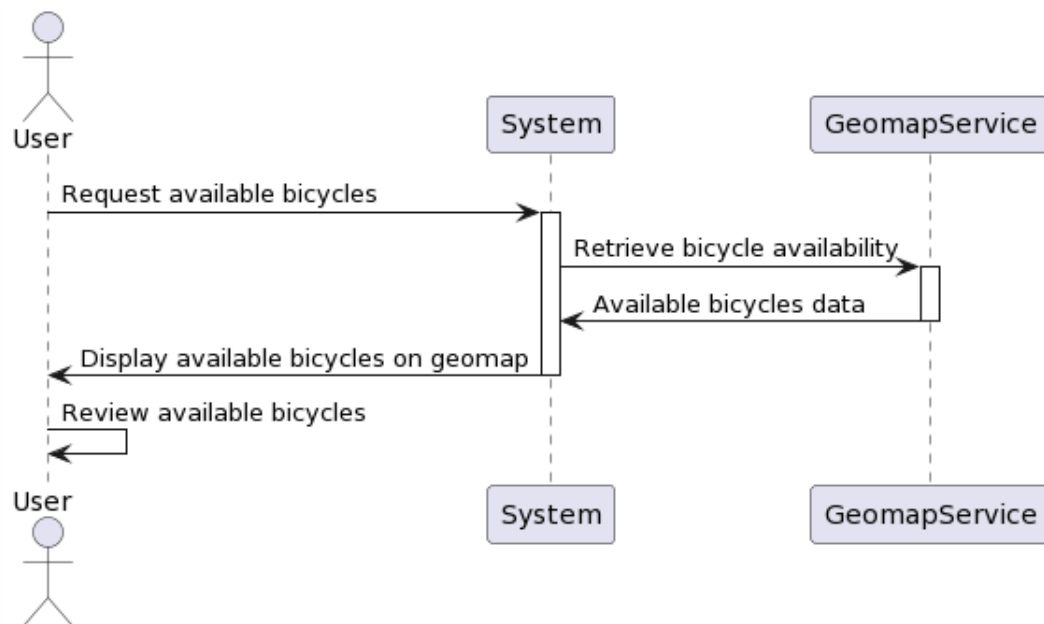
## Chapter 3

# Sequence Diagrams

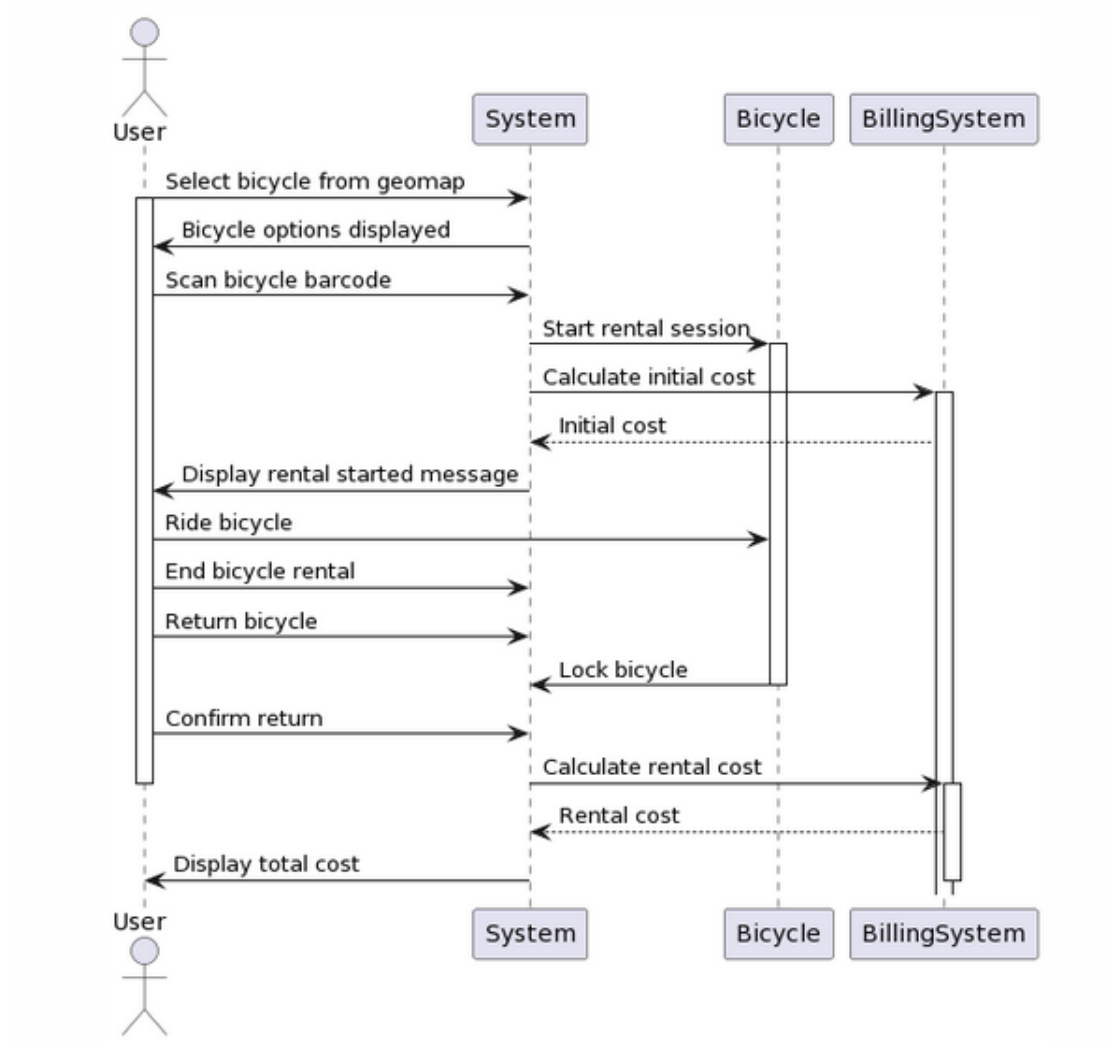
### 3.1 Log In



## 3.2 View Available Bicycles

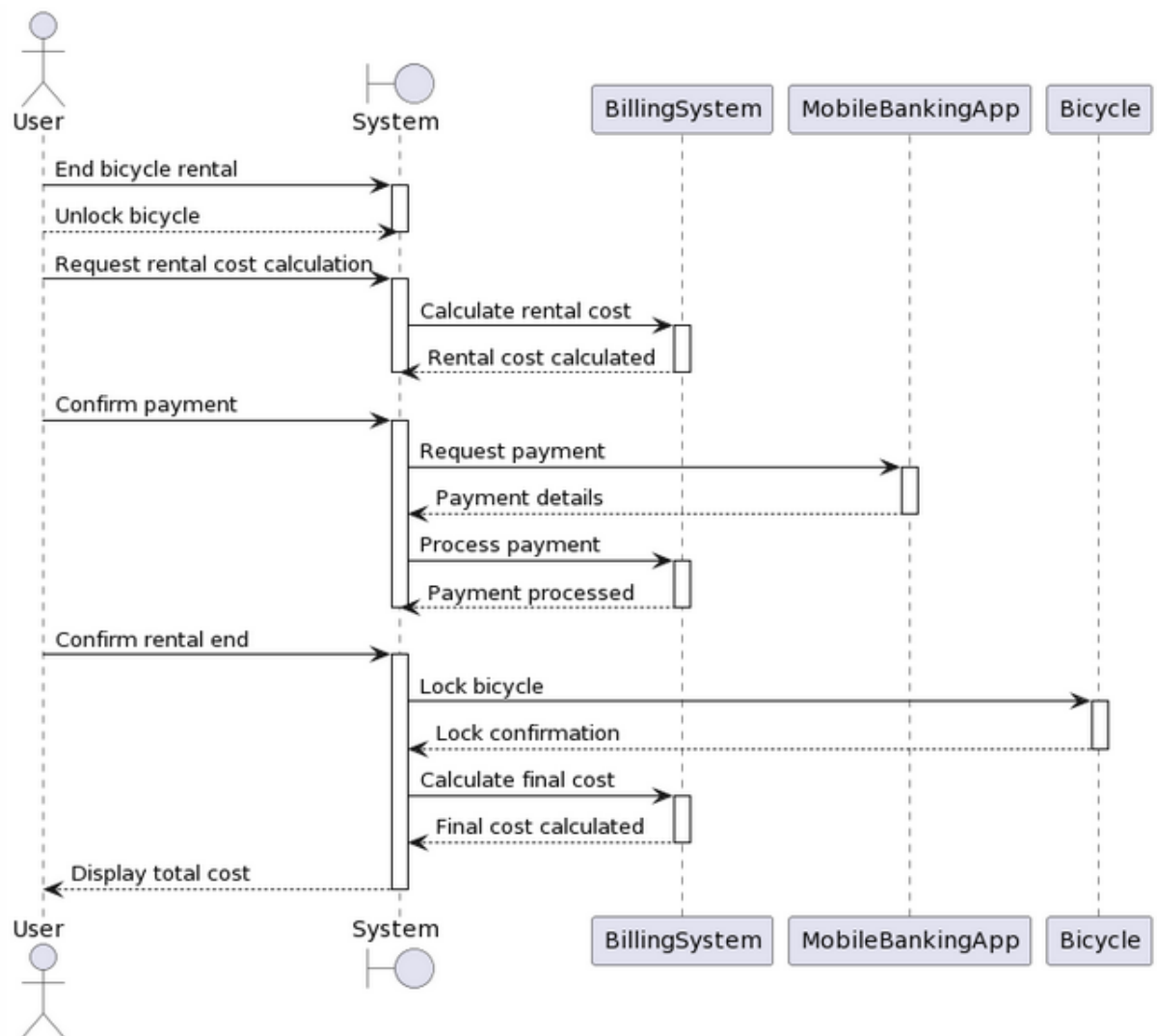


### 3.3 Rent Bicycle

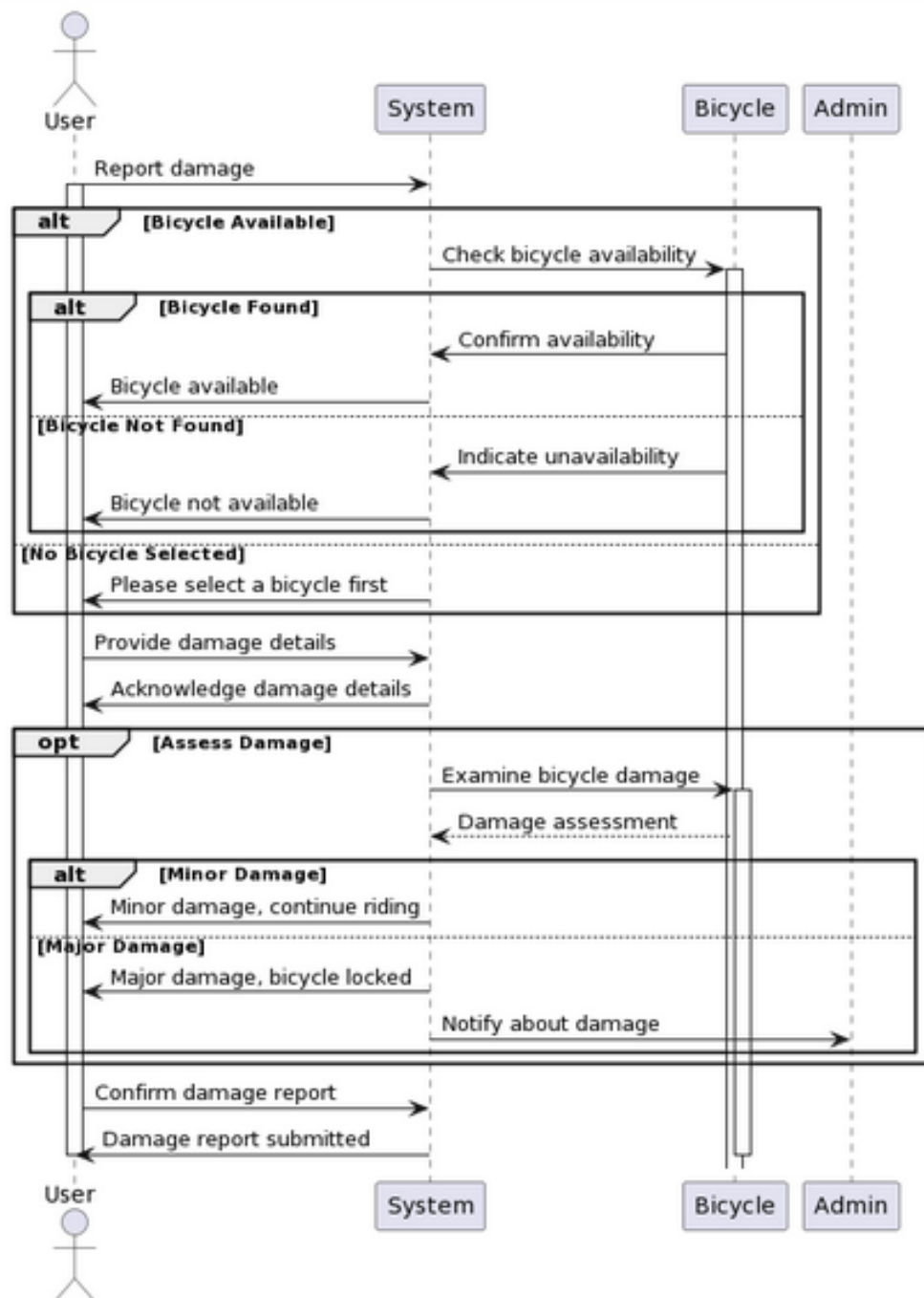




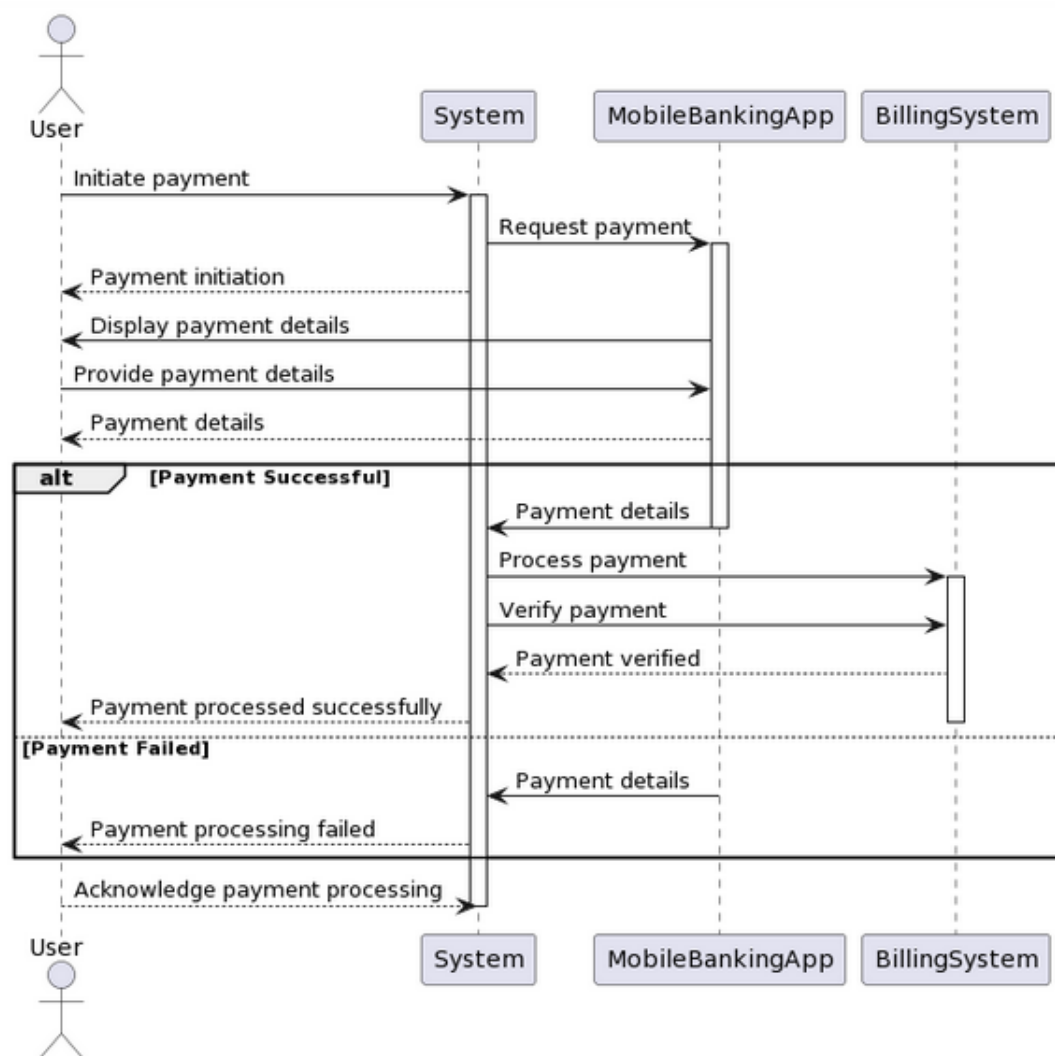
### 3.4 End Bicycle Rental



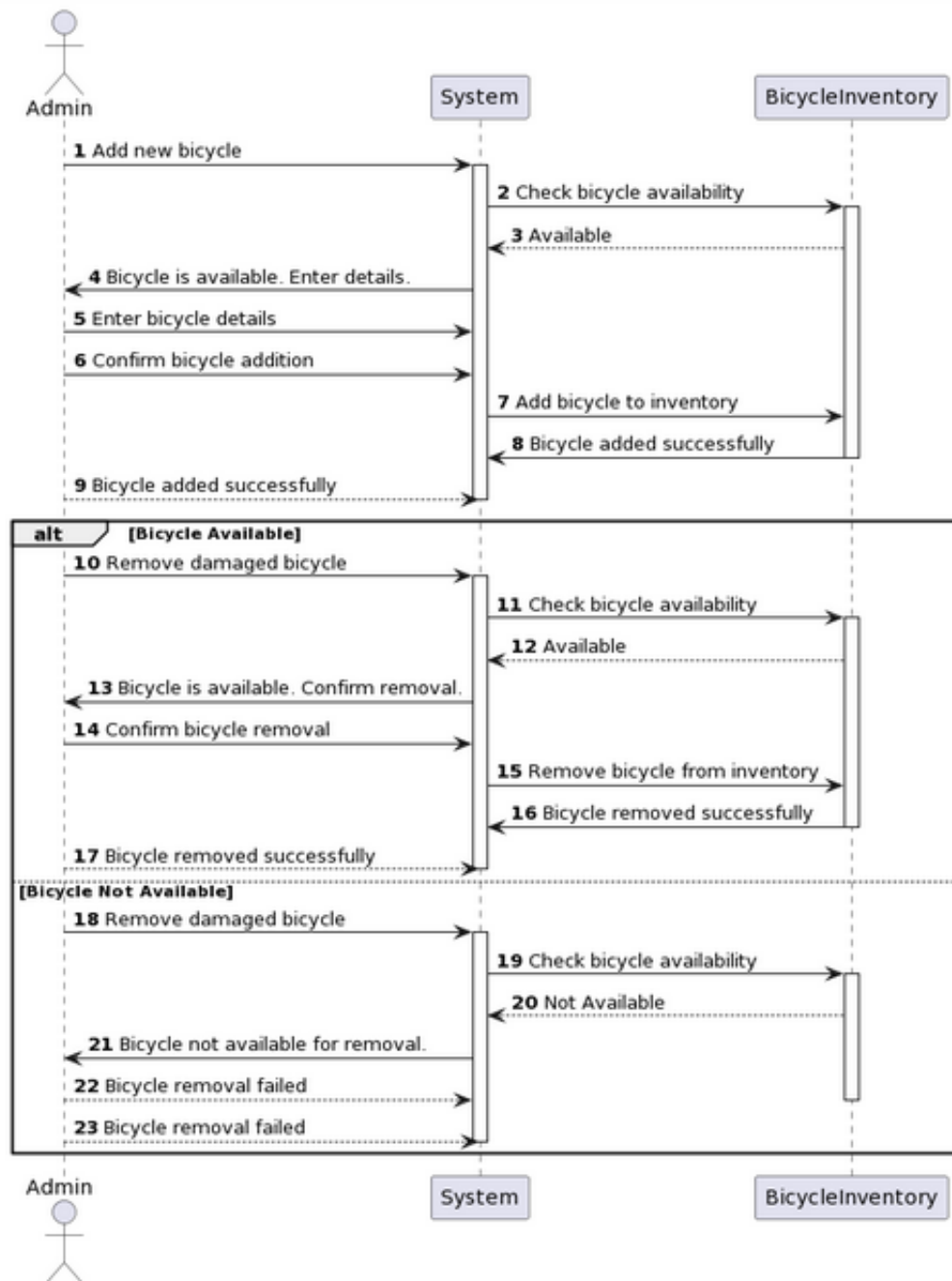
### 3.5 Report Damage



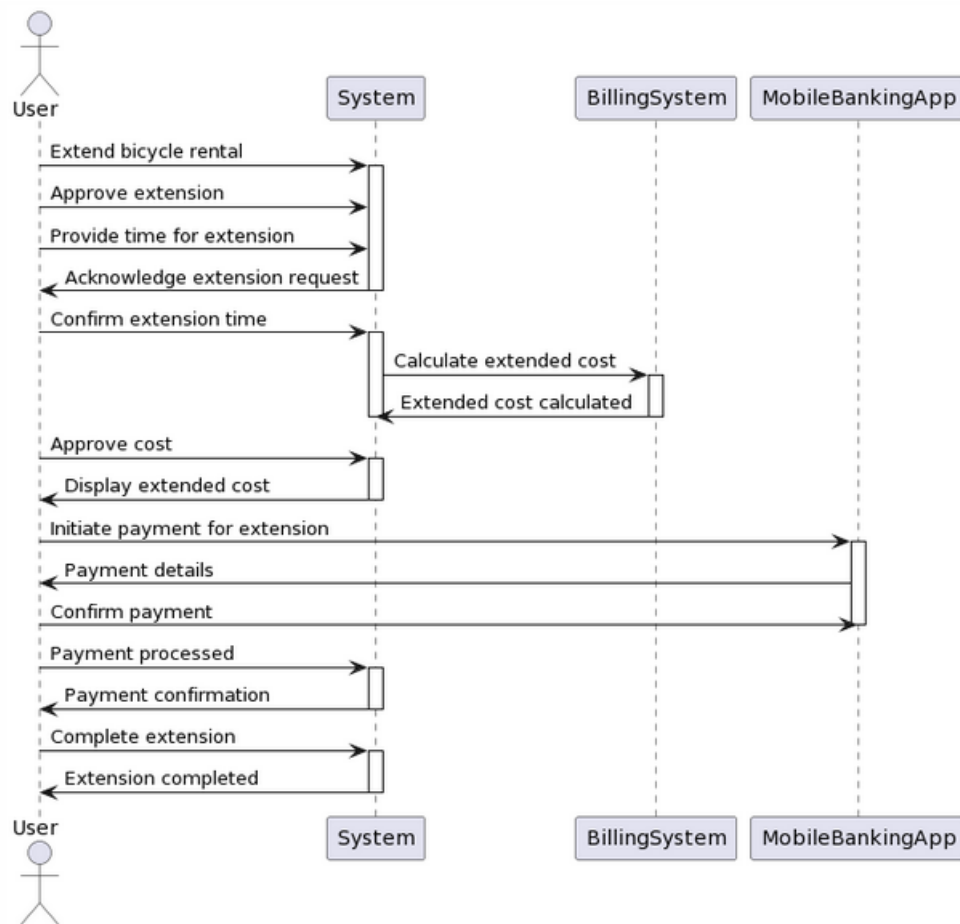
### 3.6 Process Payment



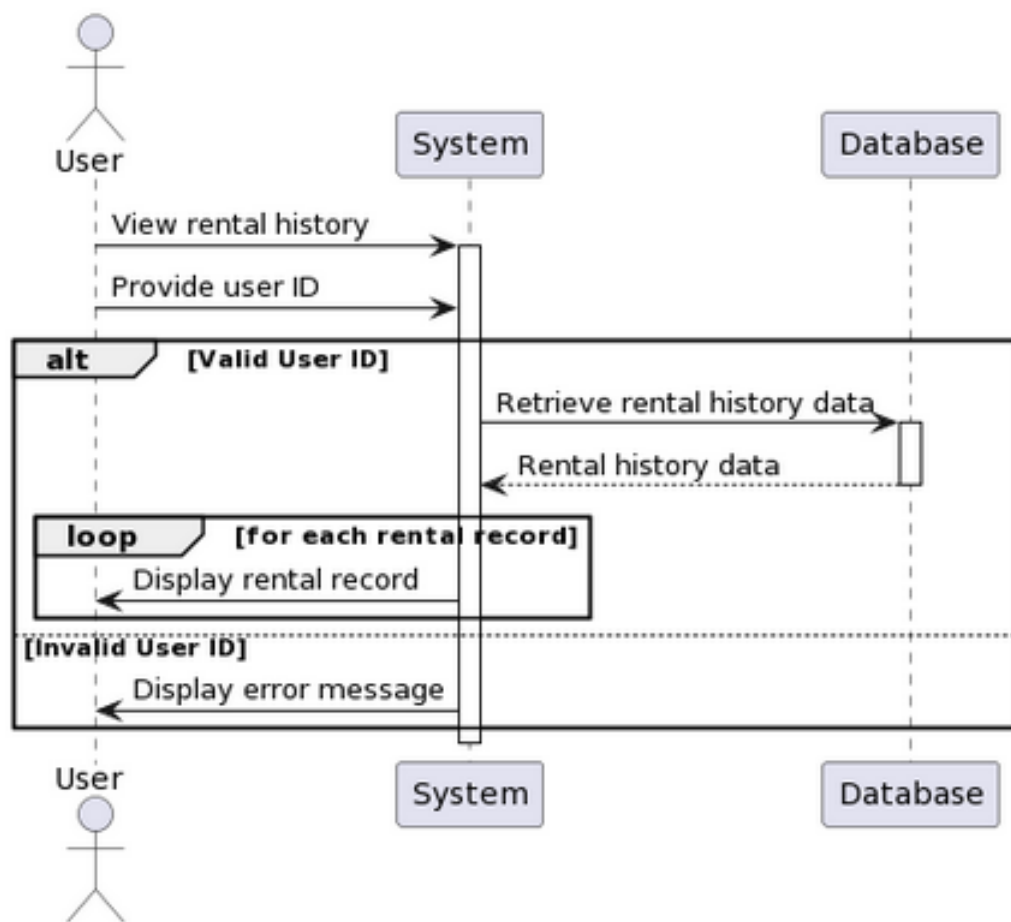
### 3.7 Admin Manage Bicycles



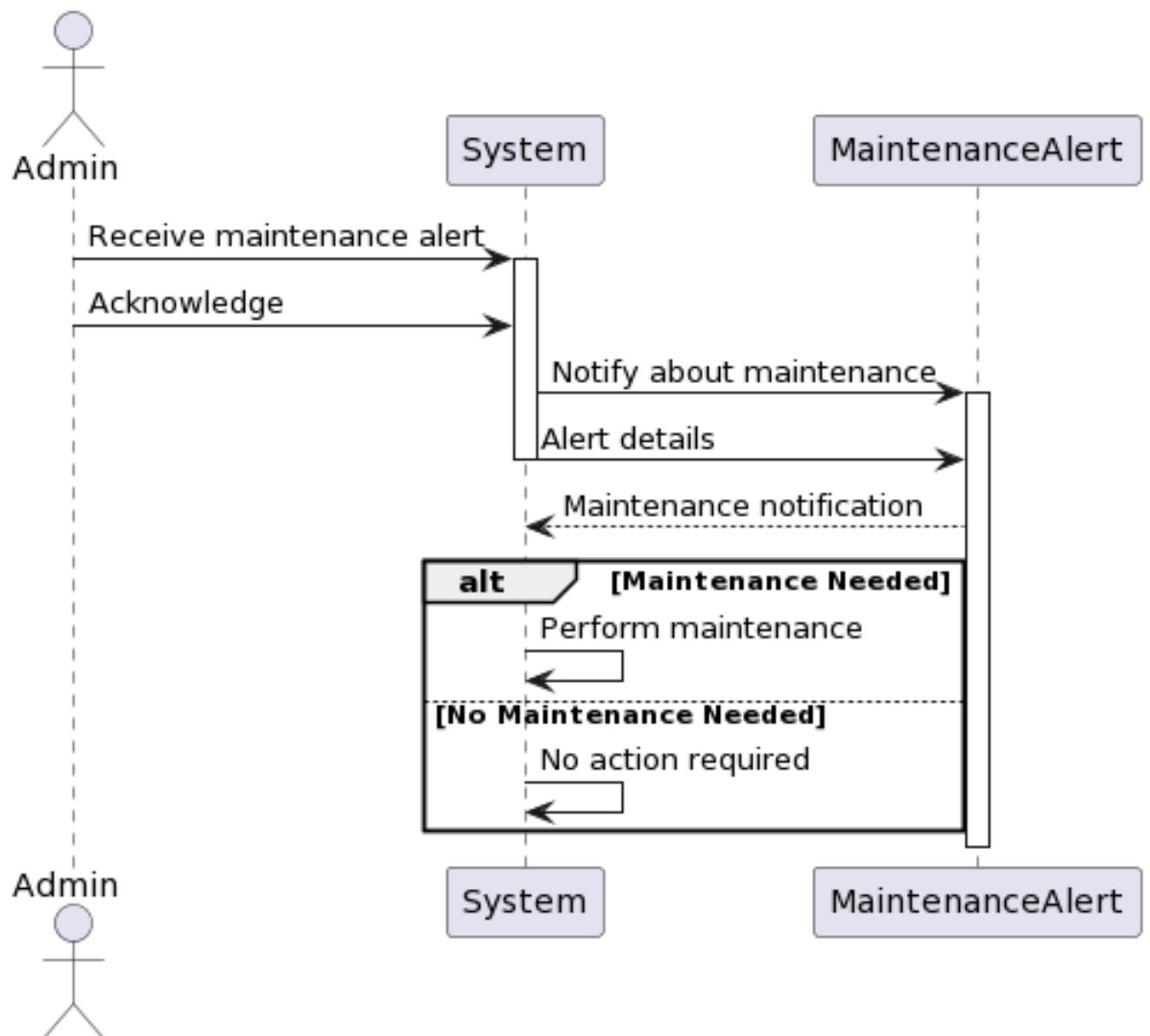
### 3.8 Extend Bicycle Rental



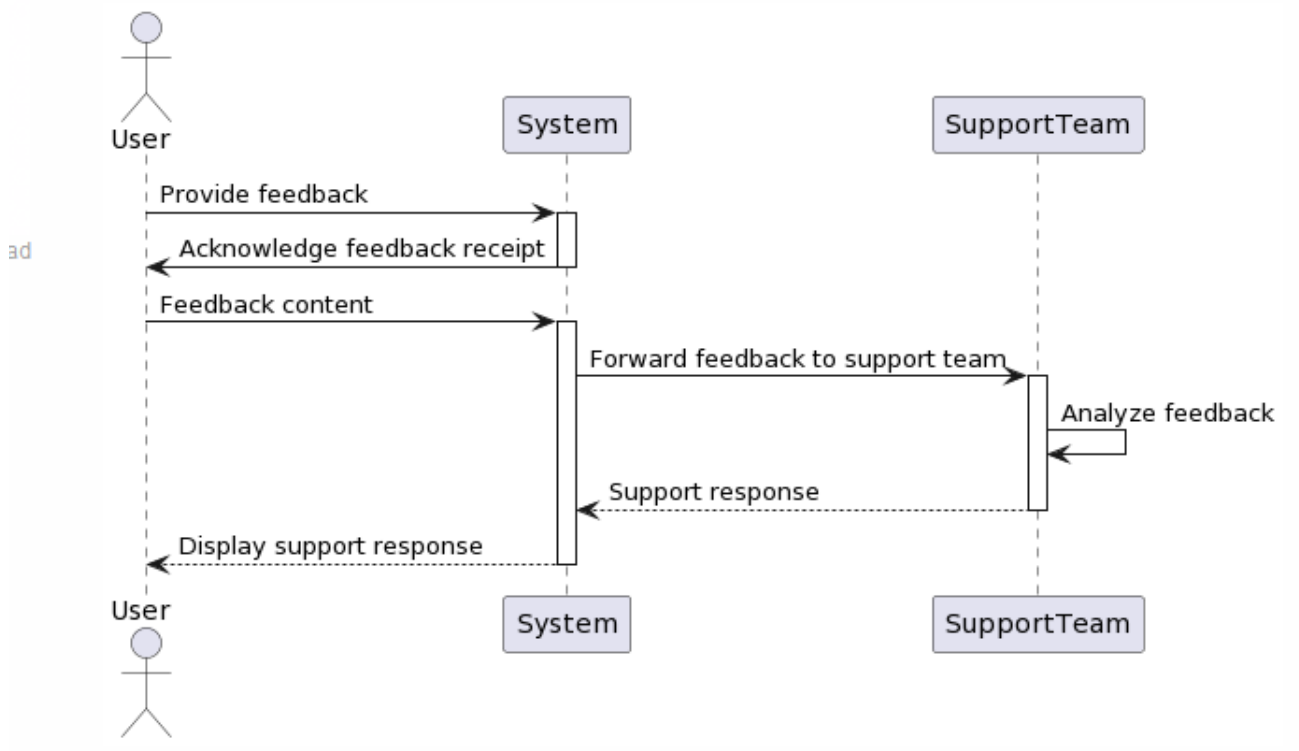
### 3.9 View Rental History



### 3.10 Receive Maintenance Alerts

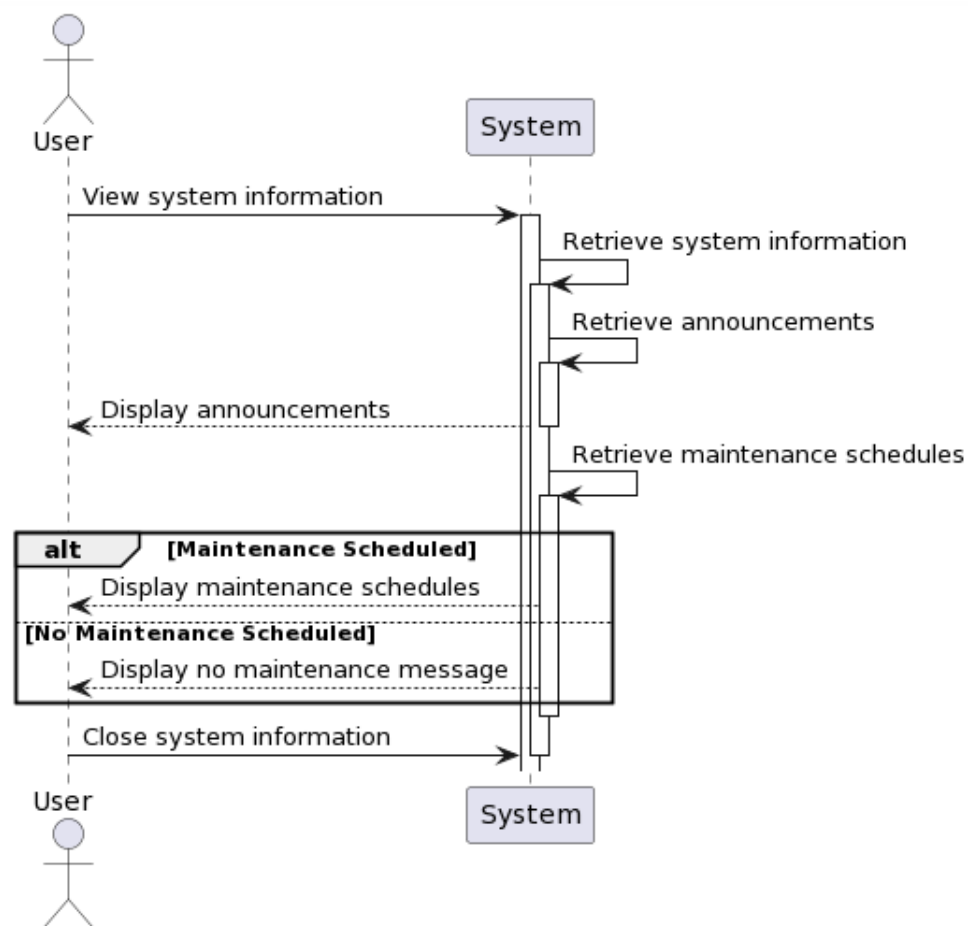


### 3.11 Provide Feedback

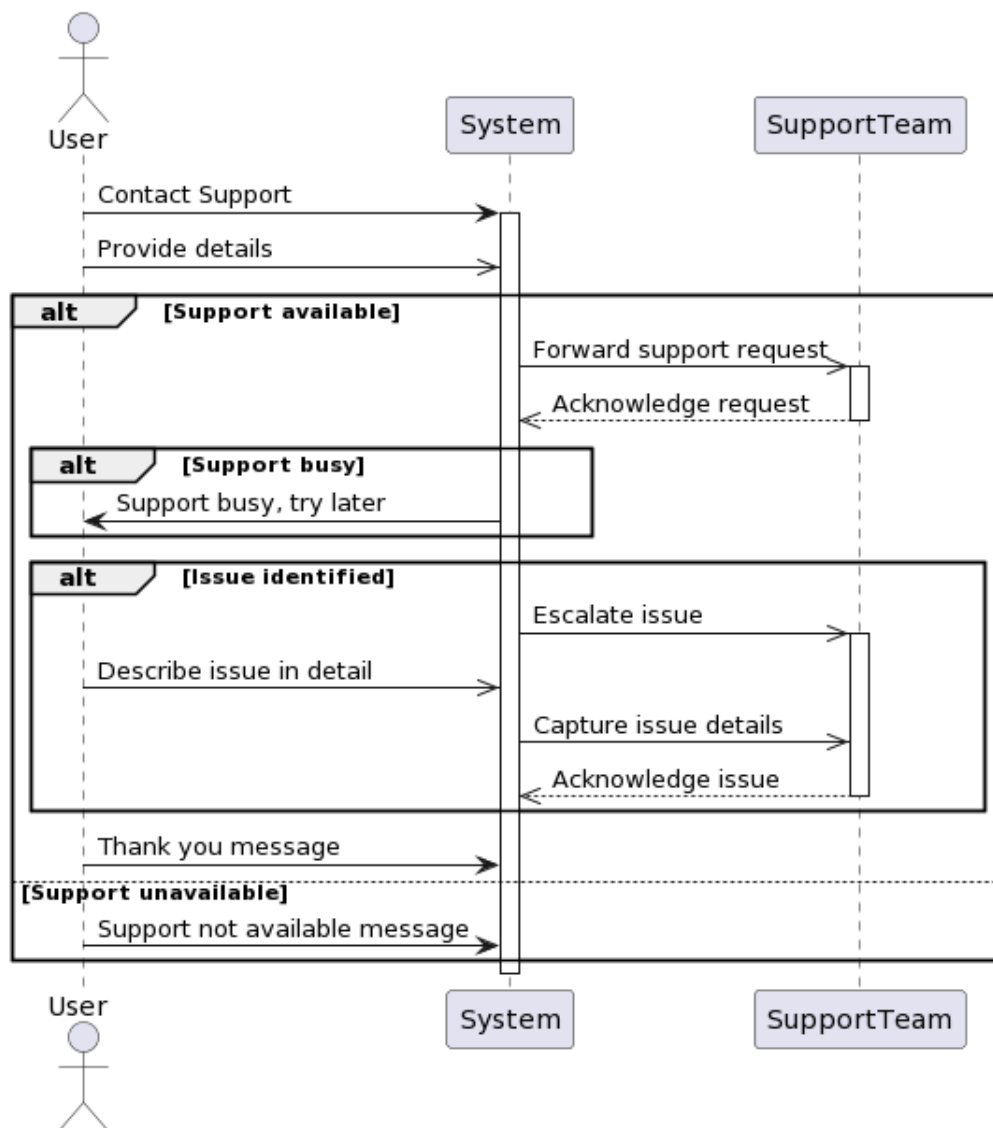




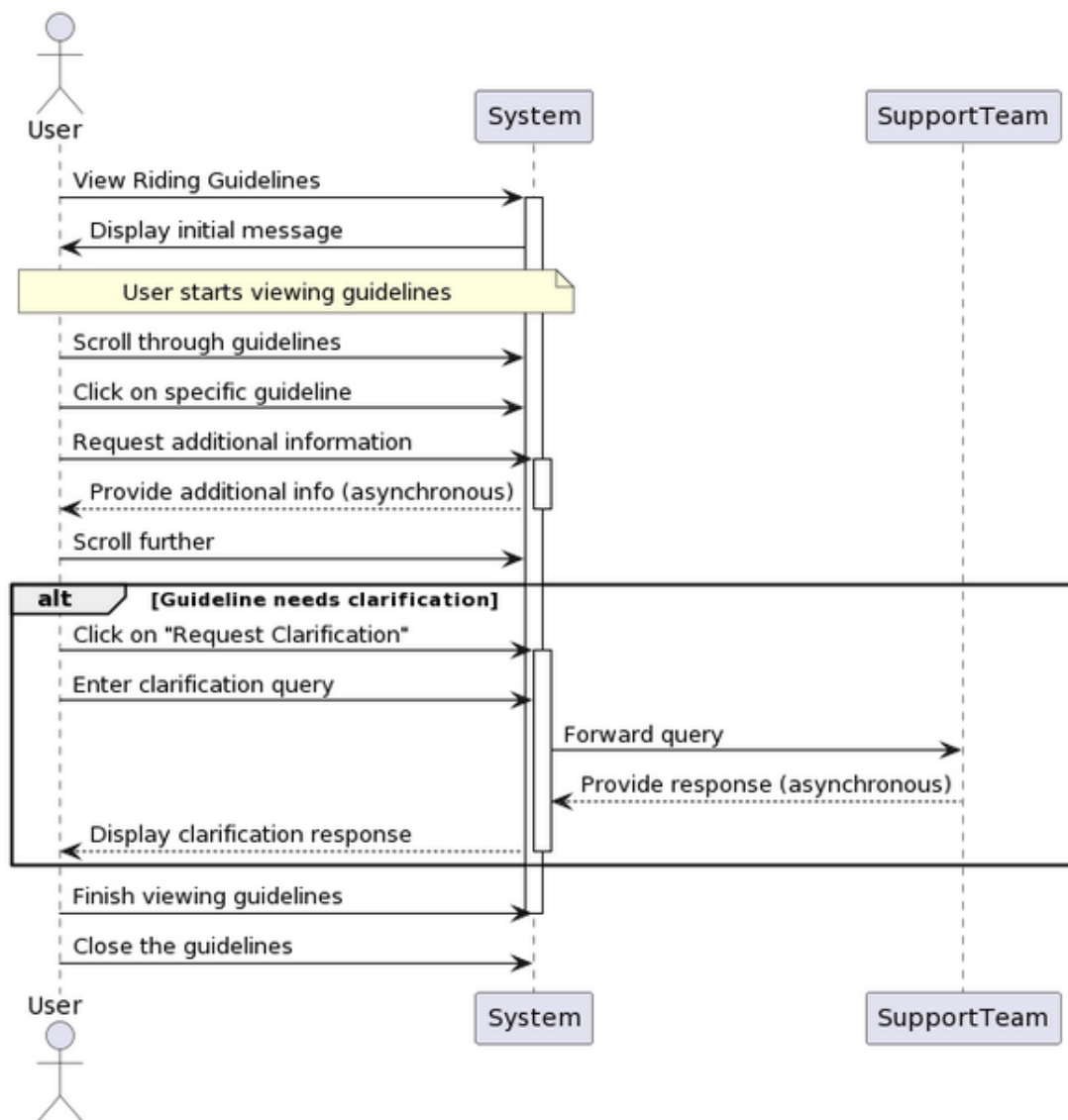
### 3.12 View System Information



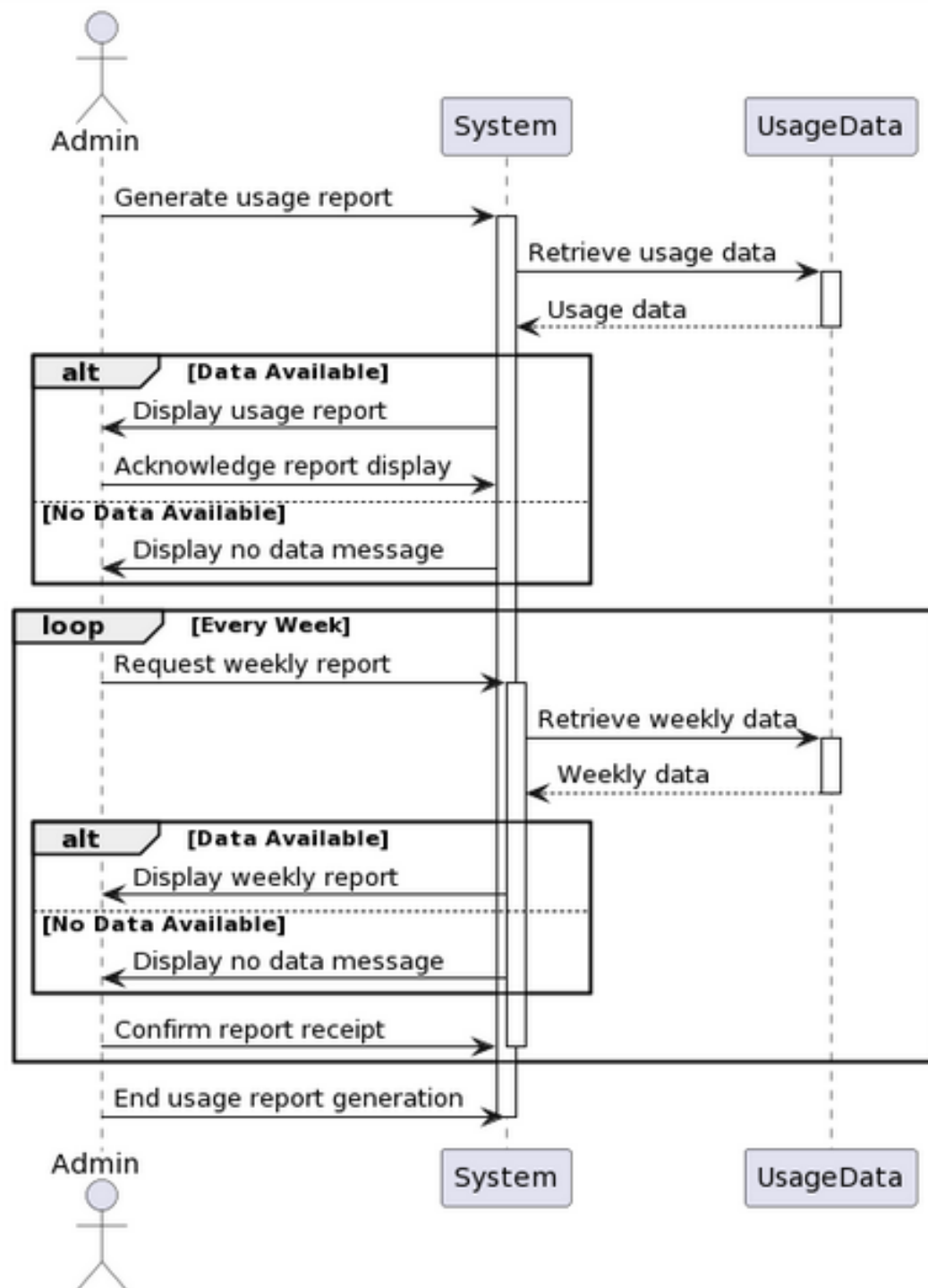
### 3.13 Contact Support



### 3.14 View Riding Guidelines



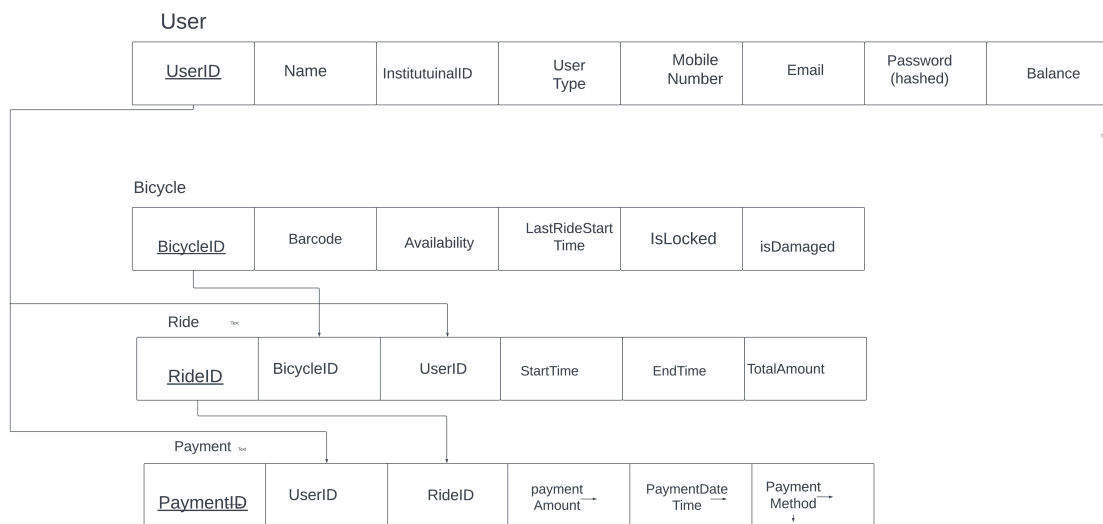
### 3.15 Generate Usage Report



## Chapter 4

# Database schema

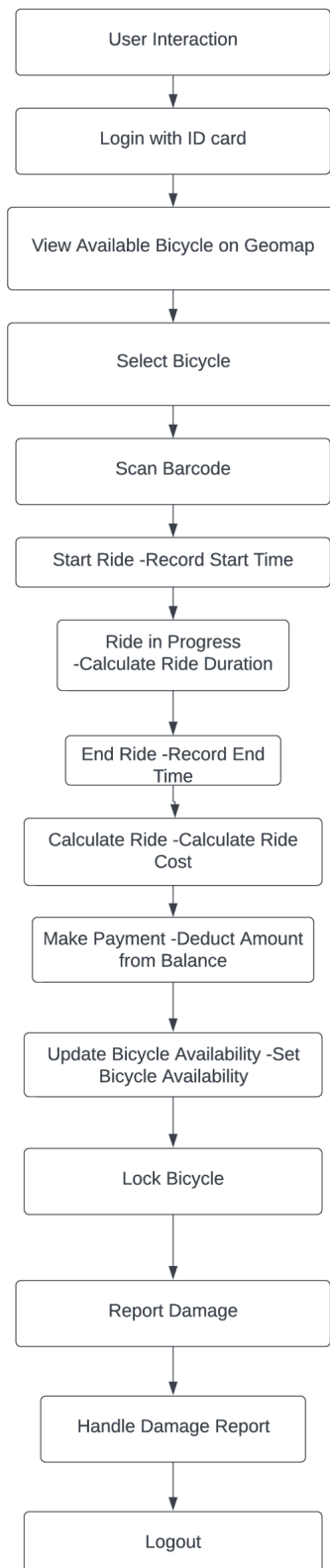
### 4.1 Database schema



## Chapter 5

# Activity Diagram

## 5.1 Activity Diagram



# Appendices



Appendix A

Glossary