Use Case Models for BIXI Montréal

System Scope: BIXI Montréal Bicycle Sharing System

System Boundary: The system includes all software and hardware components involved in managing bike rentals, including pay stations, bike docks, bikes, and the central management system. It excludes the BIXI app, which is a separate system.

Actors:

Subscriber: A person with a long-term BIXI subscription.

Non-Subscriber: A person without a BIXI subscription.

System Administrator: A person responsible for managing the BIXI system, including station configuration, bike maintenance, and subscription management.

BIXI Mechanic: A person responsible for maintaining and repairing bikes.

Pay Station: A touchscreen device used for purchasing short-term access and managing transactions.

Bike Dock: A device used to store and lock bikes.

Bike: A bicycle available for rent.

BIXI Key: A physical key used by Subscribers to unlock bikes.

Credit Card: A payment method used by Non-Subscribers.

Goals:

Summary Level:

Manage Bike Rentals: The system manages the rental and return of bikes to users.

User Goal Level:

Rent Bike as Subscriber: A Subscriber rents a bike using their BIXI key.

Rent Bike as Non-Subscriber: A Non-Subscriber rents a bike using a short-term access code purchased at the pay station.

Return Bike: A user returns a rented bike to a BIXI station.

Manage Subscription: A Subscriber manages their subscription information.

Request Bike Service: A user requests service for a bike requiring maintenance.

Sub-Functional Level:

Unlock Bike: The system unlocks a bike for a user.

Lock Bike: The system locks a bike after it is returned.

Process Payment: The system processes a payment for a short-term access code or a single ride fee.

Generate Access Code: The system generates a unique access code for a Non-Subscriber.

Calculate Rental Fee: The system calculates the rental fee based on the duration of the trip.

Send Invoice: The system sends an invoice to a Subscriber for exceeding the free rental time.

Monitor Station Status: The system monitors the availability of bikes and docks at each station.

Manage Subscription: The system manages Subscriber information and subscription details.

Request Bike Service: The system receives a request for bike service and assigns it to a BIXI Mechanic.

Use Cases

1. Rent Bike as Subscriber

Scope: BIXI Montréal System

Level: User Goal

Intention: A Subscriber wants to rent a bike using their BIXI key.

Multiplicity: Many Subscribers can rent bikes simultaneously.

Primary Actor: Subscriber

Secondary Actors: Bike Dock, Bike

Main Success Scenario:

Subscriber inserts their BIXI key into the bike dock.

Bike Dock verifies the key and unlocks the bike.

Bike Dock signals a successful unlock.

Subscriber removes the bike from the dock.

Extensions:

1a. BIXI key is invalid.

1a.1. Bike Dock displays an error message.

1a.2. Use case ends in failure.

2a. Bike is not available.

2a.1. Bike Dock displays an error message.

2a.2. Use case ends in failure.

2. Rent Bike as Non-Subscriber

Scope: BIXI Montréal System

Level: User Goal

Intention: A Non-Subscriber wants to rent a bike using a short-term access code purchased at the pay station.

Multiplicity: Many Non-Subscribers can rent bikes simultaneously.

Primary Actor: Non-Subscriber

Secondary Actors: Pay Station, Bike Dock, Bike

Main Success Scenario:

Non-Subscriber approaches the Pay Station.

Non-Subscriber selects the desired access type (1-day, 3-day, or single ride).

Non-Subscriber provides payment information (credit card).

Pay Station processes the payment and generates an access code.

Pay Station displays the access code to the Non-Subscriber.

Non-Subscriber enters the access code into the bike dock.

Bike Dock verifies the access code and unlocks the bike.

Bike Dock signals a successful unlock.

Non-Subscriber removes the bike from the dock.

Extensions:

2a. Non-Subscriber selects an invalid access type.

2a.1. Pay Station displays an error message.

2a.2. Use case continues at step 2.

3a. Payment is declined.

3a.1. Pay Station displays an error message.

3a.2. Use case ends in failure.

6a. Access code is invalid.

6a.1. Bike Dock displays an error message.

6a.2. Use case ends in failure.

3. Return Bike

Scope: BIXI Montréal System

Level: User Goal

Intention: A user wants to return a rented bike to a BIXI station.

Multiplicity: Many users can return bikes simultaneously.

Primary Actor: User

Secondary Actors: Bike Dock, Bike

Main Success Scenario:

User approaches a BIXI station with a rented bike.

User inserts the bike into an empty bike dock.

Bike Dock verifies the bike and locks it.

Bike Dock signals a successful lock.

Extensions:

2a. All bike docks are full.

2a.1. User waits for a dock to become available.

2a.2. Use case continues at step 2.

3a. Bike fails to lock properly.

3a.1. Bike Dock displays an error message.

3a.2. User contacts BIXI support for assistance.

3a.3. Use case ends in failure.

4. Manage Subscription

Scope: BIXI Montréal System

Level: User Goal

Intention: A Subscriber wants to manage their subscription information.

Multiplicity: Many Subscribers can manage their subscriptions simultaneously.

Primary Actor: Subscriber

Secondary Actors: System Administrator

Main Success Scenario:

Subscriber logs into their BIXI account.

Subscriber views their subscription details.

Subscriber updates their subscription information (e.g., payment method, contact details).

System Administrator verifies the updated information.

System Administrator updates the Subscriber's account.

System Administrator informs Subscriber that the account is updated.

Extensions:

4a. Subscriber forgets their password.

4a.1. System Administrator sends a password reset link to the Subscriber's email address.

4a.2. Use case continues at step 1.

5. Request Bike Service

Scope: BIXI Montréal System

Level: User Goal

Intention: A user wants to request service for a bike requiring maintenance.

Multiplicity: Many users can request bike service simultaneously.

Primary Actor: User

Secondary Actors: Bike Dock, BIXI Mechanic

Main Success Scenario:

User presses the service button on the bike dock.

Bike Dock sends a service request to the system.

System assigns the service request to a BIXI Mechanic.

BIXI Mechanic receives the service request and repairs the bike.

Extensions:

2a. Bike Dock fails to send the service request.

2a.1. User contacts BIXI support for assistance.

2a.2. Use case ends in failure.

6. Unlock Bike

Scope: BIXI Montréal System

Level: Sub-Functional

Intention: The system unlocks a bike for a user.

Multiplicity: The system can unlock multiple bikes simultaneously.

Primary Actor: None

Secondary Actors: Bike Dock, Bike, BIXI Key, Access Code

Main Success Scenario:

Bike Dock receives a valid BIXI key or access code.

Bike Dock verifies the key or code.

Bike Dock unlocks the bike using the motor.

Bike Dock signals a successful unlock.

Extensions:

6a. Key or code is invalid.

6a.1. Bike Dock displays an error message.

6a.2. Use case ends in failure.

7. Lock Bike

Scope: BIXI Montréal System

Level: Sub-Functional

Intention: The system locks a bike after it is returned.

Multiplicity: The system can lock multiple bikes simultaneously.

Primary Actor: None

Secondary Actors: Bike Dock, Bike

Main Success Scenario:

Bike is inserted into the bike dock.

Bike Dock verifies the bike.

Bike Dock locks the bike using the motor.

Bike Dock signals a successful lock.

Extensions:

7a. Bike fails to lock properly.

7a.1. Bike Dock displays an error message.

7a.2. System logs the error.

8. Process Payment

Scope: BIXI Montréal System

Level: Sub-Functional

Intention: The system processes a payment for a short-term access code or a single ride fee.

Multiplicity: The system can process multiple payments simultaneously.

Primary Actor: None

Secondary Actors: Pay Station, Credit Card

Main Success Scenario:

Pay Station receives payment information from the Non-Subscriber.

Pay Station verifies the payment information.

Pay Station processes the payment through the payment gateway.

Pay Station confirms the successful payment.

Extensions:

8a. Payment is declined.

8a.1. Pay Station displays an error message.

8a.2. Use case ends in failure.

9. Generate Access Code

Scope: BIXI Montréal System

Level: Sub-Functional

Intention: The system generates a unique access code for a Non-Subscriber.

Multiplicity: The system can generate multiple access codes simultaneously.

Primary Actor: None

Secondary Actors: Pay Station

Main Success Scenario:

Pay Station receives a successful payment.

Pay Station generates a unique access code.

Pay Station displays the access code to the Non-Subscriber.

Extensions:

9a. System fails to generate an access code.

9a.1. Pay Station displays an error message.

9a.2. Use case ends in failure.

10. Calculate Rental Fee

Scope: BIXI Montréal System

Level: Sub-Functional

Intention: The system calculates the rental fee based on the duration of the trip.

Multiplicity: The system can calculate multiple rental fees simultaneously.

Primary Actor: None

Secondary Actors: None

Main Success Scenario:

System receives the start and end times of the trip.

System calculates the duration of the trip.

System retrieves the applicable rental rates.

System calculates the rental fee based on the duration and rates.

Extensions:

10a. System encounters an error during rental fee calculation.

10a.1. System logs the error.

11. Send Invoice

Scope: BIXI Montréal System

Level: Sub-Functional

Intention: The system sends an invoice to a Subscriber for exceeding the free rental time.

Multiplicity: The system can send multiple invoices simultaneously.

Primary Actor: None

Secondary Actors: None

Main Success Scenario:

System identifies a Subscriber who has exceeded the free rental time.

System calculates the additional rental fee.

System generates an invoice containing the trip details and additional fee.

System sends the invoice to the Subscriber's email address.

Extensions:

11a. System encounters an error during invoice sending.

11a.1. System logs the error.

12. Monitor Station Status

Scope: BIXI Montréal System

Level: Sub-Functional

Intention: The system monitors the availability of bikes and docks at each station.

Multiplicity: The system can monitor multiple stations simultaneously.

Primary Actor: None

Secondary Actors: Bike Dock

Main Success Scenario:

Bike Dock sends real-time updates on bike and dock availability to the system.

System stores and processes the updates.

System provides real-time station status information to users through the BIXI app or website.

Extensions:

12a. Bike Dock fails to send updates.

12a.1. System logs the error.

13. Manage Subscription

Scope: BIXI Montréal System

Level: Sub-Functional

Intention: The system manages Subscriber information and subscription details.

Multiplicity: The system can manage multiple subscriptions simultaneously.

Primary Actor: None

Secondary Actors: None

Main Success Scenario:

System stores Subscriber information (e.g., name, contact details, payment method).

System manages subscription details (e.g., subscription type, start date, end date).

System updates Subscriber information and subscription details based on user requests.

Extensions:

13a. System encounters an error during subscription management.

13a.1. System logs the error.

14. Request Bike Service

Scope: BIXI Montréal System

Level: Sub-Functional

Intention: The system receives a request for bike service and assigns it to a BIXI Mechanic.

Multiplicity: The system can receive multiple service requests simultaneously.

Primary Actor: None

Secondary Actors: Bike Dock, BIXI Mechanic

Main Success Scenario:

Bike Dock sends a service request to the system.

System assigns the service request to a BIXI Mechanic based on their availability and location.

System sends a notification to the assigned BIXI Mechanic.

Extensions:

14a. No BIXI Mechanic is available.

14a.1. System logs the error.