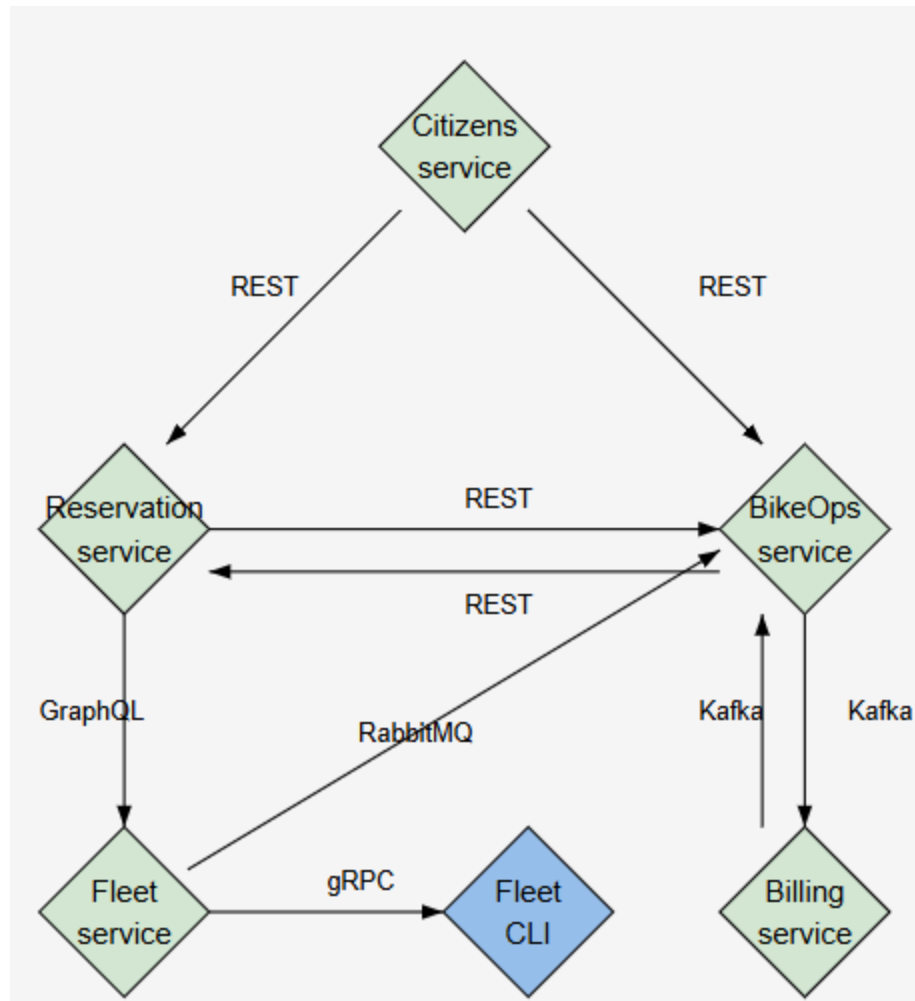


Smart City Bike Sharing System

This system would allow citizens to find, reserve, use, and pay for public bikes while giving city administrators tools to manage the fleet, analyze usage patterns, and optimize bike distribution.



- **Citizens Service:** Handles user registration, authentication, profiles, and bike usage permissions
- **Reservation Service:** Manages bike bookings, trip planning, and reservation confirmations

- **BikeOps Service** (replacing Rental service): Handles bike check-out/check-in, trip tracking, and station management
- **Fleet Service** (replacing Inventory service): Tracks all bikes, their status (available, in-maintenance, in-use), and distribution across stations
- **Billing Service**: Manages payments, subscriptions, usage fees, and penalties for late returns

Key System Functionalities

User Management (Citizens Service)

- User registration and profile management
- Authentication and authorization
- Subscription management
- User history and preferences
- Rating system for reporting issues

Bike Reservation (Reservation Service)

- Station and bike availability search
- Trip planning based on available routes
- Reservation creation and confirmation
- Reservation modification and cancellation
- Queue management for high-demand stations

Bike Operations (BikeOps Service)

- Bike unlock/lock mechanism integration
- Trip tracking and monitoring
- Check-out and check-in process
- Ride status updates in real-time

- Emergency assistance requests
- Station operational status monitoring

Fleet Management (Fleet Service)

- Bike inventory tracking
- Bike status monitoring (available, in-use, maintenance)
- Maintenance scheduling and tracking
- Station capacity management
- Bike redistribution planning
- Theft prevention and recovery

Billing and Payments (Billing Service)

- Pay-per-use charging
- Subscription billing
- Deposit handling
- Late fees and penalties
- Refunds and compensations
- Payment gateway integration
- Invoice and receipt generation

Reporting and Analytics (Cross-cutting)

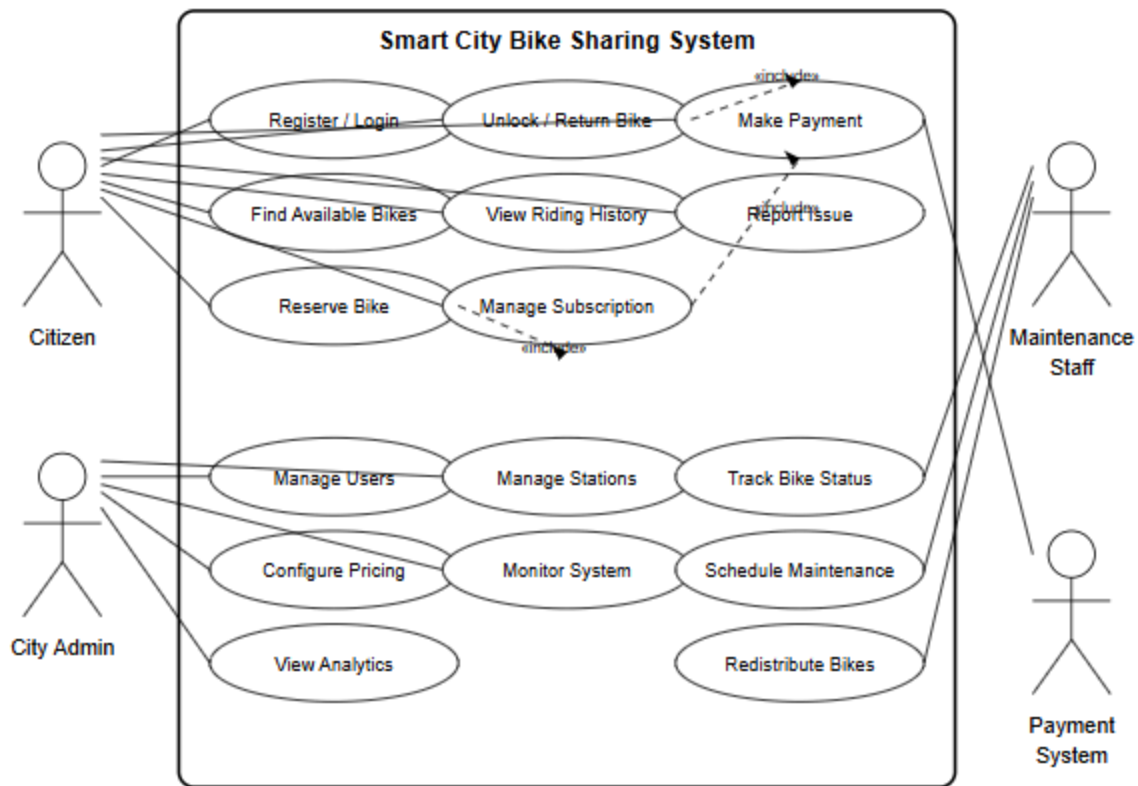
- Usage statistics and trends
- Revenue reporting
- Maintenance cost tracking
- Station utilization patterns
- User behavior analysis
- Environmental impact metrics

Administration (Management Interface)

- System configuration
- User management and support
- Pricing structure management
- Station network planning
- Promotional campaign management

Mobile App Features

- GPS-based station locator
- QR code scanning for bike unlock
- Real-time trip tracking
- In-app payments
- Issue reporting
- Ride history



Here's a use case diagram for our Smart City Bike Sharing System that illustrates the key interactions between actors and the system. The diagram includes four primary actors:

1. **Citizen** (Regular User) - The main users of the bike sharing service
2. **City Administrator** - Staff who manage and monitor the overall system
3. **Maintenance Staff** - Personnel responsible for bike maintenance and redistribution
4. **Payment System** - External system that processes financial transactions

Citizen Use Cases:

- Register/Login
- Find Available Bikes
- Reserve Bike
- Unlock/Return Bike

- View Riding History
- Manage Subscription
- Make Payment
- Report Issue

City Administrator Use Cases:

- Manage Users
- Configure Pricing
- View Analytics
- Manage Stations
- Monitor System

Maintenance Staff Use Cases:

- Track Bike Status
- Schedule Maintenance
- Redistribute Bikes

The diagram also shows some important relationships:

- The "Reserve Bike" use case includes "Make Payment" functionality
- "Unlock/Return Bike" includes payment processing
- "Manage Subscription" requires payment processing

Smart City Bike Sharing System - UI Mockup Descriptions

Citizen User Interfaces

1. Home/Login Screen

- Clean, minimalist design with city-themed background
- Center-aligned login form with username/email and password fields
- "Login" button (primary color) and "Register" link below
- "Forgot Password" link under the login form
- Quick access map preview showing bike stations without requiring login
- Header with language selector and app download buttons
- Footer with links to terms, privacy policy, and support

2. User Registration

- Multi-step form with progress indicator at top
- Step 1: Basic Information (Name, Email, Phone, Password)
- Step 2: Address Information (optional)
- Step 3: Payment Method Setup (credit card, PayPal, etc.)
- Step 4: Terms agreement with checkboxes
- Responsive design that works well on mobile
- Clear validation feedback for form fields

3. Main Dashboard

- Top navigation bar with profile menu, notifications, and balance
- Large map section showing nearby stations with bike availability
- Action card section with quick buttons (Find Bike, Reserve, Report Issue)
- "Active Rentals" section if user has bikes checked out
- "Recent Rides" section showing last 3-5 trips
- Sidebar with account summary and subscription status

4. Bike Station Map

- Full-screen interactive map with zoom controls

- Station pins color-coded by availability (green=many bikes, yellow=few bikes, red=no bikes)
- Info panels that appear when clicking stations
- Filter controls at top for bike types
- Search bar for finding specific locations
- Bottom panel that slides up with detailed station info
- Directions button that integrates with map services

5. Bike Reservation Screen

- Station details at top (name, address, operating hours)
- List of available bikes with:
 - Bike thumbnail
 - Type indicator (standard/electric)
 - Battery percentage (for e-bikes)
 - Condition rating (stars)
- Time selector for reservation duration
- Cost estimate calculator
- Large "Confirm Reservation" button at bottom

Admin Interfaces

1. Admin Dashboard

- Data-rich dashboard with key metrics displayed as cards
- System health indicators with color-coding
- Real-time counts of active users and rides
- Mini-maps showing hotspots of activity
- Alert notifications panel
- Quick access to common administrative functions

- Revenue and usage graphs

2. Station Management

- Dual view: Map and list views toggled by tabs
- Station markers on map with status indicators
- Data table of stations with sortable columns
- Station detail panel with usage statistics
- Capacity management tools
- Maintenance scheduling interface

3. Analytics Dashboard

- Comprehensive data visualization section
- Multiple chart types (line, bar, heat maps)
- Filterable by date ranges and bike types
- Usage pattern graphs by time of day
- Revenue tracking and forecasting
- Export functionality for reports

Mobile App Specific Screens

1. Mobile Quick Unlock

- Large camera viewfinder for QR scanning
- Manual entry option with numeric keypad
- NFC tap indicator (for compatible phones)
- Large "Start Ride" button
- Emergency contacts button
- Current location indicator

2. Active Ride Screen

- Prominent timer showing ride duration
- Current cost calculation updating in real-time
- Map showing current location
- Directions to nearest return stations
- Large "End Ride" button
- Issue reporting button
- Ride statistics (speed, distance, etc.)