American International University-Bangladesh (AIUB)

Department of Computer Science

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Bangladesh Metro Rail Mobile Ticketing & NFC Integration System

Software Requirement Engineering

Sec: **B**

Project submitted

By

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1. PROBLEM DOMAIN

1.1 Background to the Problem

Dhaka, the bustling capital of Bangladesh, grapples with daily traffic congestion. The Dhaka Metro Rail, a revolutionary infrastructure project, aims to ease this burden and provide a faster, more reliable mode of transportation. However, the current ticketing system, reliant on physical queues at stations, creates bottlenecks and hinders passenger experience.

1.2 Solution to the Problem

This project proposes a cutting-edge solution: a mobile application and Near-Field Communication (NFC) integration for the Bangladesh Metro Rail ticketing system. This user-centric approach will transform daily commutes:

- **Mobile App:** Passengers can download a user-friendly app to:
    - Purchase tickets (single or return) for specific journeys.
    - Select departure and arrival stations.
    - Choose travel dates and times (if applicable).
    - Securely pay for tickets using various options (credit cards, mobile wallets).
    - View trip details, download tickets (QR code or digital format), and manage travel history.
    - Access real-time information on ticket availability and estimated travel times.
- **NFC Integration:** Stations will be equipped with NFC readers. Passengers can simply tap their smartphones (with the app and active ticket) at the reader for quick and contactless entry.

Why is this solution ideal?

- **Convenience:** Passengers can purchase tickets on the go, eliminating queues and station wait times.
- **Efficiency:** The system streamlines the ticketing process, improving overall passenger flow.
- **Security:** Secure payment gateways and encrypted data storage to ensure user safety.
- **Accessibility:** The app caters to diverse users, including those unfamiliar with Bengali text.
- **Scalability:** The system can adapt to future growth in ridership and system expansion.

Existing Solutions:

Several metro systems globally have successfully implemented mobile ticketing and contactless fare collection using NFC technology. Studying these models will provide valuable insights into Bangladesh's unique needs.

2. SOLUTION DESCRIPTION

2.1 System Features

- **User Registration and Login:** Secure account creation with basic information for personalized ticketing.
- **Ticket Purchase:** Intuitive interface for journey selection, fare calculation, and secure payment processing.
- **Payment Gateway Integration:** Integration with trusted payment gateways for seamless transactions.
- **Ticket Management:** Easy access to purchased tickets, QR code downloads, and travel history.
- **Real-time Information:** Live updates on ticket availability, travel times, and any service disruptions.
- **Push Notifications:** Timely alerts about trip details, boarding gate updates, and delays.
- **NFC Integration:** Secure and contactless fare validation through NFC-enabled smartphones.
- **Multilingual Support:** The app will be available in Bangla and English for wider accessibility.
- **Customer Support:** A dedicated help section within the app and contact information for inquiries.

Quality Attributes:

- **Security:** User data and transaction details will be protected using industry-standard encryption protocols.
- **Performance:** The app will be optimized for smooth operation even on devices with varying processing power and internet connectivity.
- **Usability:** An intuitive and user-friendly interface will ensure a smooth experience for passengers of all technical abilities.
- **Availability:** The system will be highly available with minimal downtime for maintenance.

2.2 UML Diagrams

Figure1: use-case diagram

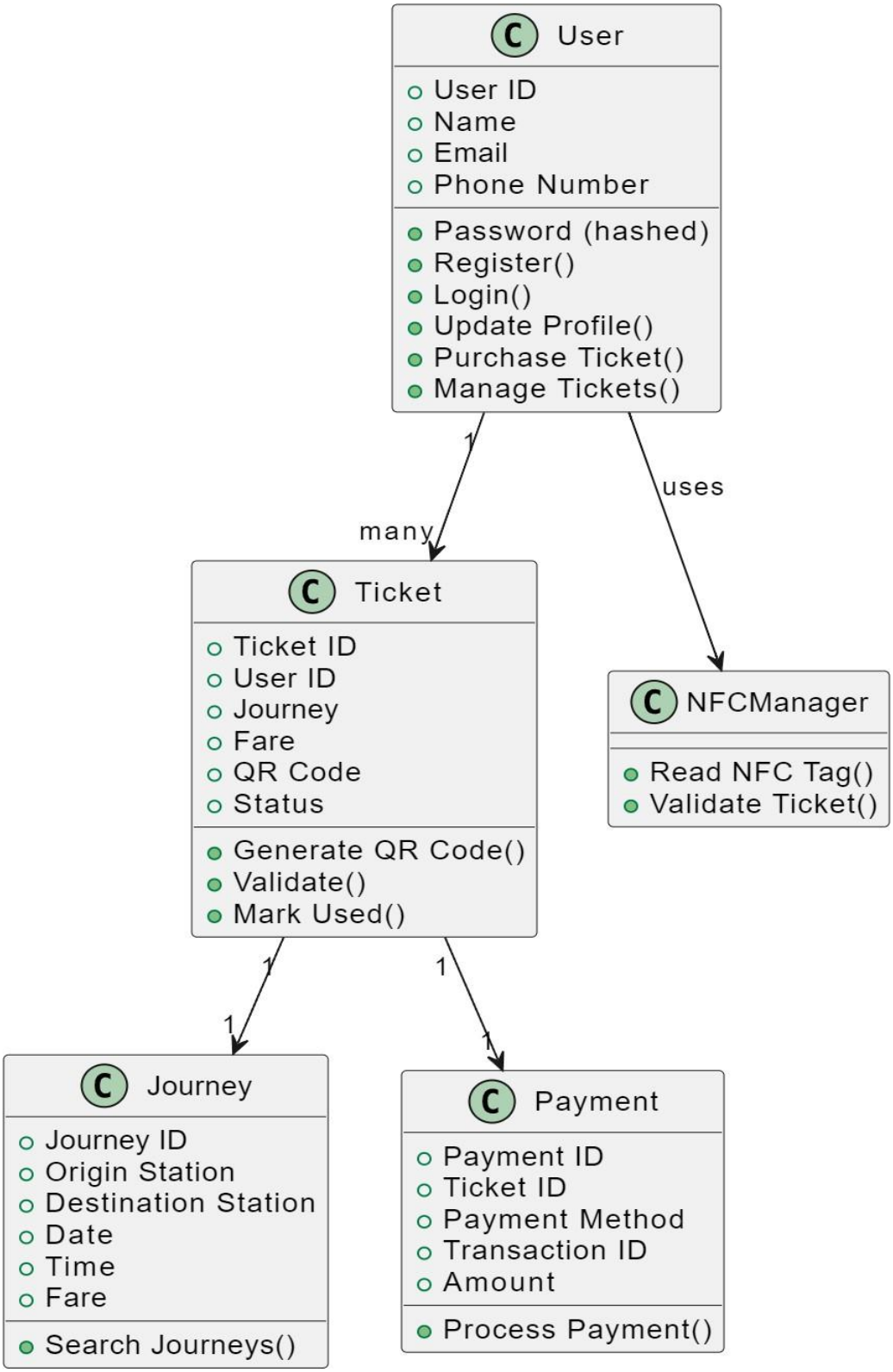


Figure 2: Class Diagram

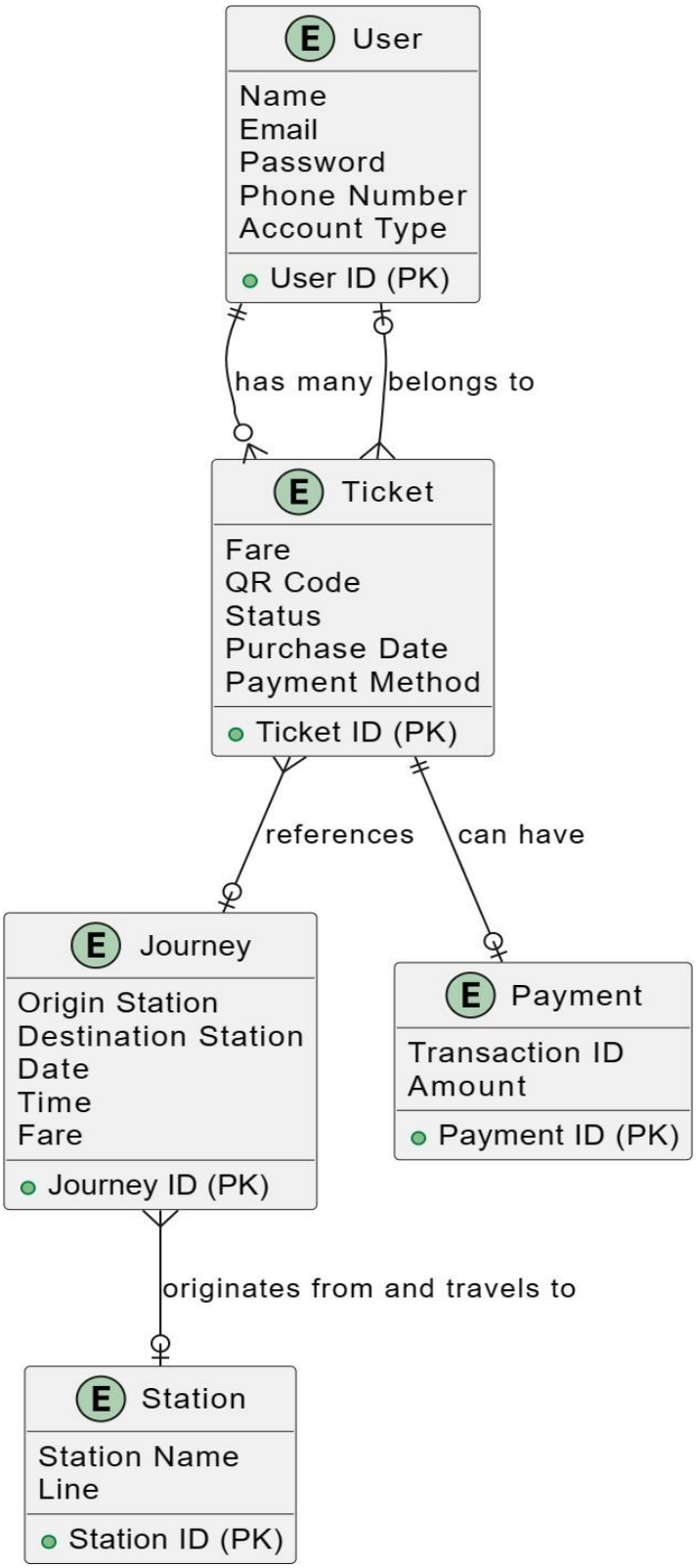
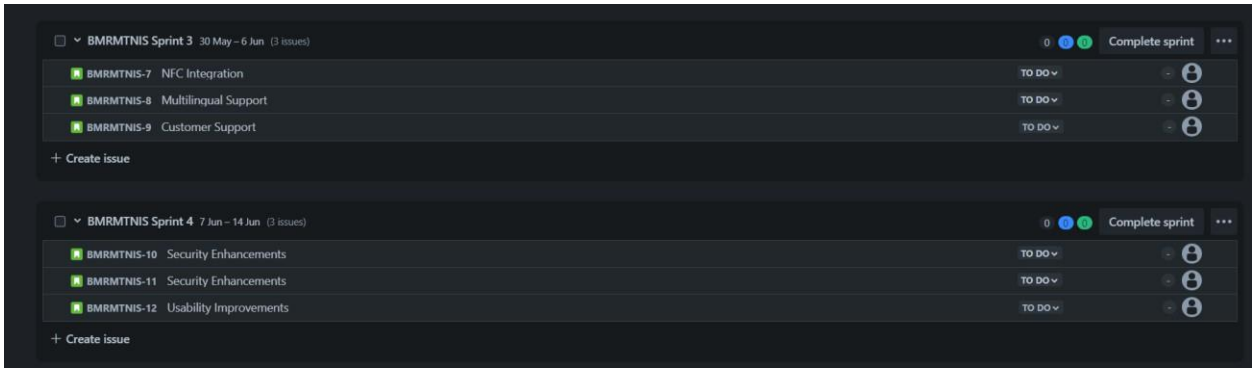


Figure 3: E-R Diagram

3. Social Impact

- **Reduced Traffic Congestion:** By encouraging public transport use, the system will contribute to decongesting Dhaka's roads.
- **Improved Air Quality:** Fewer vehicles on the road will lead to cleaner air and a healthier environment.
- **Enhanced Accessibility:** The app's features will cater to passengers with disabilities, promoting inclusive mobility.
- **Economic Benefits:** Efficient public transport fosters economic activity by ensuring a smoother flow of goods and services.

4. Development Plan with Project Schedule



5. Marketing Plan

Short-term (Launch):

- Partner with the Dhaka Mass Transit Company Limited (DMTCL) for official promotion through their channels (website, social media, station displays).
- Collaborate with local media outlets (newspapers, radio, TV) to reach a wider audience.
- Launch social media campaigns highlighting the app's convenience and benefits.
- Offer incentives for early adopters, such as discounts on first few ticket purchases.

Long-term (Growth):

- Develop a comprehensive marketing strategy targeting different demographics (students, professionals, etc.).
- Partner with ride-hailing services for seamless integration with public transportation journeys.
- Explore incorporating location-based services within the app for real-time arrival and departure information.
- Analyze user data to understand travel patterns and optimize the app for improved efficiency.
- Partner with local businesses near metro stations for cross-promotional opportunities (e.g., discounts for metro ticket holders at local shops).
- Conduct user surveys and gather feedback to continually improve the app's features and user experience.

6. Cost and Profit Analysis

Cost Analysis:

1. Development Costs:

- **Mobile App Development:**
  - **Hourly Rate:** $25 - $50 per hour
  - **Estimated Time:** 3000 - 5000 hours
  - **Estimated Cost:** $75,000 - $250,000
- **NFC Integration:**
  - **Development Effort:** Lower than app development due to existing libraries and APIs
  - **Estimated Cost:** $25,000 - $50,000
- **Backend Development:**
  - Cost depends on server infrastructure, database needs, and integration complexity.
  - **Estimated Cost:** $20,000 - $50,000

2. Hardware Costs:

- **NFC Readers:**
  - Cost per reader varies depending on features and range.
  - Estimate 100 readers for major stations (cost can be adjusted based on station coverage).
  - **Estimated Cost:** $50,000 - $100,000

3. Other Costs:

- **Project Management:** $10,000 - $20,000
- **Quality Assurance (QA) Testing:** $10,000 - $20,000
- **UI/UX Design:** $5,000 - $10,000
- **Server Infrastructure:** Ongoing cost based on usage and scalability needs.

Total Estimated Cost: $195,000 - $500,000

7. Reference

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2. **Mobile Ticketing Market - Global Forecast to 2028:** https://www.grandviewresearch.com/industry-analysis/smart-ticketing-market

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5. **Transport for London (TfL) Mobile Ticketing App:** https://tfl.gov.uk/fares/how-to-pay-and-where-to-buy-tickets-and-oyster/tfl-oyster-and-contactless-app
6. **Shenzhen Metro QR Code Ticketing System:** http://www.szpsq.gov.cn/english/Life/Transportation/content/post_7611217.html