Software Requirements Specification

for

Routewise – A Dhaka Intracity Travel Assistance Platform

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Revision History

Name	Date	Reason For Changes	Version
Initial Release	10/11/24	-	1.0
Final Release	09/01/25	Updated requirements	2.0

1. Introduction

1.1 Purpose

The purpose of this Software Requirements Specification (SRS) document is to define the functionality, features, and requirements for the **Routewise** platform. Routewise is designed as a comprehensive and responsive web-based platform providing detailed public transportation information for commuters in Dhaka, Bangladesh. The platform will offer users information about local bus routes, Bus Rapid Transit (BRT), Mass Rapid Transit (MRT) lines, and additional transit resources. Additionally, it allows users the convenience of buying a bus pass, which offers unlimited bus rides on the selected route within a month at an attractive price for regular commuters. This document aims to provide an in-depth understanding of the system's goals, user interactions, and technical constraints to ensure a seamless development process and fulfill all project objectives.

1.2 Document Conventions

All headings and sections are formatted in bold for ease of reference. Key points and features are also formatted in bold for ease of reading. References are made in-line where applicable and compiled in Section 1.5.

1.3 Intended Audience and Reading Suggestions

This SRS document is intended for the Development Team, Project Managers, External Stakeholders, Testers, and End Users. It shall assist in clarifying the development requirements, project goals, timeline and scope, considerations for business needs and expectations, verification and validation of features, and providing reference for guides related to system usage respectively.

Readers wanting a high-level overview of the system may begin reading from section 2. Developers and testers are recommended to emphasize reading from section 3 and onwards. Section 5 outlines the quality attributes for stakeholders concerned with performance, security, and user experience.

1.4 Project Scope

Routewise is a web-based platform aimed to provide comprehensive intracity public transport information for commuters in Dhaka, Bangladesh. Its primary purpose is to act as a **reliable user-friendly guide to conveniently navigate and use the city's bus and rapid transit systems**. It includes the core functionalities of: Displaying available buses on routes related to the user's current location and destination, Filtering search results to match user preferences, Allowing purchases/validation/printing of bus passes for unlimited rides on selected routes for a specified month at an attractive price for regular commuters, Offering detailed listings of local buses including routes and applicable stops, Supporting information on Dhaka's Bus Rapid (BRT) and Mass Rapid Transit (MRT) systems, Providing Additional Resources such as maps, foreigner guides, safety tips, and FAQs, and Contact options and information about the platform itself.

By simplifying the route planning process and providing relevant guidance, the platform garners a better experience for public-transport users in Dhaka and supports broader business goals of improving urban mobility, promoting public transport usage, and contributing to sustainable city living. This release focuses on establishing core features, with future plans to expand transit coverage for other cities. It also includes an admin control interface for creating, updating, retrieving, and deleting buses, stations, bus routes, and more as well as managing feedback from users.

1.5 References

1. Data for routes and inspiration of website features collected from:
    a. https://dhakabusroute.com/
    b. https://dhakabusservice.com/
    c. https://mestogo.theinfoport.com/
    d. https://en.wikipedia.org/wiki/Dhaka_Metro_Rail
    e. https://en.wikipedia.org/wiki/Dhaka_BRT
2. Images used in website:
    a. Logo: mestogo.theinfoport.com/assets/bus.svg
    b. Dhaka BRT Logo: https://dhakabrt.gov.bd/
    c. BRT Image: https://www.afrik21.africa/en/nigeria-with-afd-support-kaduna-relies-on-brt-to-improve-mobility/
    d. MRT Image: https://www.japantimes.co.jp/news/2023/02/17/asia-pacific/dhaka-metro-clean-transport/
    e. MRT Map: https://jahinzee.github.io/
    f. Stock Images are compiled from pictures marked as "for commercial use" on Google Images.
3. Interactive Map: iFrame
4. Code for hamburger menu and some portion of database queries (specifically joining tables) are AI generated using ChatGPT.

2. Overall Description

2.1 Product Perspective

Routewise is a web-based application developed to provide comprehensive public transportation information for commuters within Dhaka, Bangladesh. The platform is designed as a user-friendly tool to assist users in navigating the city's bus and rapid transit systems. Routewise operates as a standalone system, but it can be integrated with other local transit databases and open-source maps to enhance its functionality, such as by functionality related to the Dhaka Metro Pass and Rapid Pass. This version is part of a broader effort to improve urban mobility and public transport accessibility, aligning with Dhaka's sustainable transport goals. The platform will also be expandable to other cities in future releases.

2.2 Product Features

The **Routewise** platform aims to offer the following core features:

a. **Bus Route Search:** Users can input their current location and destination to view available local bus routes.
    i. **Filtering:** Users can filter bus routes based on criteria such as bus type or air conditioning,
    ii. **Detailed Bus Listings:** Provides comprehensive information on local buses, including route maps, bus stops, and timings
b. **Bus Pass Management:** Users can apply for a bus pass which offers unlimited rides on a user-selected route and bus company for a user-selected month, at an attractive discounted fee for regular commuters such as students and office workers.
    i. **Bus Pass Purchasing:** Users can apply and pay for the bus pass to ensure it is active
    ii. **Bus Pass Verification and Download:** Users can verify their Bus Pass using their Bus Pass ID and download a printable version of their pass.
c. **BRT and MRT Information:** Offers detailed information about Dhaka's Bus Rapid Transit (BRT) and Mass Rapid Transit (MRT) lines, including schedules and stops
d. **Additional Resources:**
    i. **Interactive map**: Users can navigate an interactive map of Dhaka for quick guidance without having to leave the website
    ii. **Hotspots**: Users can find popular hotspots and destinations-by-bus within Dhaka, for their next visit.
    iii. **Foreigner Guide:** Foreigners as well as first-time users alike can get preparatory information regarding Dhaka's local bus culture, such as priority seating for women, short stoppage times, no fixed schedule, etc.
    iv. **Safety Tips:** Emergency contact information and emergency numbers are displayed on the site for critical scenarios.
    v. **Contact and Support:** Facilitates communication with the admin team for any further queries, complaints, or need for assistance.

2.3 Stakeholders and Characteristics

Routewise serves a broad range of users, each with different needs. The primary group consists of **local commuters** who rely on Dhaka's public buses, BRT, and MRT systems for daily travel and need reliable, up-to-date information about routes, stops, and schedules. **Regular commuters** can also take advantage of the bus pass service for convenience and economic benefits (i.e.: discounted total fare assuming monthly commute as well as saved time in not having to haggle fares with bus conductors). **Tourists and foreign visitors** requiring additional resources such as foreigner guides and easy-to-understand navigation tools to effectively use the city's transit system. **Public transport enthusiasts** are users may prefer exploring various routes and transport options to find the most convenient or efficient ways to travel across Dhaka, or promote the system to encourage public transport use and development. Lastly, the platform may also serve **transit authorities and operators**, who can contribute data and use Routewise as a communication tool to provide important service updates to the public. **Others** are also welcome to use the platform for relevant information, promotion, and guidance.

2.4 Operating Environment

Routewise is a web-based platform designed to run on all updated web browsers. It will be optimized to function seamlessly on a **range of devices**, including desktop

computers, laptops, tablets, very large screens, and smartphones, ensuring a consistent and responsive user experience **across different screen sizes**. As it primarily caters to **commuters in Dhaka**, it is optimized for areas with **low to moderate bandwidth**, ensuring the platform remains functional even in less ideal network conditions. A relatively stable **internet connection** will be required for users to access the service, particularly for real-time information retrieval, but the system will be lightweight enough to perform well even in slower network environments. Due to its responsive nature, the **platform can also be downloaded as a mobile application** with the use of various third-party extensions.

2.5 Design and Implementation Constraints

The development and functionality of **Routewise** are subject to several constraints. A key limitation is **available data reliability**, as the platform relies on manually collecting updated and accurate information at reasonable intervals from all local bus companies to provide users with the right routes and bus details. The system is also limited by **restricted APIs**, preventing integrated functionality related to Dhaka Metro Pass and Rapid Pass. Further limitations arise with **Multi-lingual support**; ensuring the website supports both English and Bengali is difficult to implement as some databases do not correctly support Bengali characters. The website must also be developed to run on **poor-network conditions** as commuters using the service could likely be on mobile data plans in various locations.

2.6 User Documentation

Routewise maintains an updated **Software Requirements Specification** and a **Contact Us** section on its platform so users can directly reach out for any related usage-related assistance. The service also provides demo videos and screenshots for added support. Future versions may incorporate **in-platform interactive tutorials and user manuals** in the About section of the platform.

2.7 Assumptions and Dependencies

Routewise assumes that users will have **access to the internet** to utilize the platform effectively, particularly for retrieving real-time transit data. The system's success is highly dependent on the availability of accurate and regularly **updated data from local bus authorities**, which is crucial for maintaining the reliability of the service. The platform also depends on **third-party mapping services**, such as Google Maps for providing an interactive experience. Lastly, as Dhaka's public transport infrastructure expands, it is assumed that Routewise will need to be **updated regularly** to incorporate new routes, transport services, and any changes in the city's transit system.

3. System Features

3.1 Bus Route Search and Display

3.1.1 Description and Priority

This feature allows users to search for available buses based on their current location and desired destination. The system will display a list of relevant buses, including route details such as stops. This is a High priority feature, as it forms the core functionality of the platform, directly benefiting users by simplifying the process of finding appropriate bus routes.

3.1.2 Stimulus/Response Sequences

The user enters their current location and destination in the search fields and clicks the "Go" button. The system processes the inputs and displays a list of buses servicing the selected route, including relevant information.

3.1.3 Functional Requirements

REQ-1: The system must allow users to input their current location and destination to find available bus routes.
REQ-2: The system must display a list of buses that match the route, including all the stops.
REQ-3: The system must handle invalid inputs by providing error messages or suggesting alternatives.

3.2 Bus Pass Management

3.2.1 Description and Priority

The Bus Pass Management feature enables regular commuters (such as students and office workers) to apply for a bus pass, which provides unlimited rides on a selected route and bus company for a user-chosen month at a discounted rate. This is a High priority feature as it offers convenience and economic benefits for users who rely on daily commuting.

3.2.2 Stimulus/Response Sequences

Bus Pass Purchasing: The user selects the desired route, bus company, and month, then proceeds to apply and pay for the bus pass. Once payment is completed, the system activates the bus pass for the chosen period.
Bus Pass Verification and Download: The user enters their Bus Pass ID to verify the pass. If it is a valid pass, the system allows the user to download a printable version of the bus pass for use.

3.2.3 Functional Requirements

REQ-1: The system must allow users to select their preferred route, bus company, and month to apply for a bus pass.
REQ-2: The system must enable users to complete the payment for the bus pass and activate it for the selected period.
REQ-3: The system must allow users to verify their Bus Pass using the Bus Pass ID.
REQ-4: The system must provide users with a downloadable, printable version of their bus pass after successful verification.

3.3 Route Filtering

3.3.1 Description and Priority

This feature allows users to apply filters to the search results or all local bus routes, to narrow down the bus options based on their preferences (e.g.: air conditioning, safety rating, etc.). This is a Medium priority feature, as it enhances the user experience by making the search results more relevant to individual preferences.

3.3.2 Stimulus/Response Sequences

The user applies filters by selecting pre-set options on the sidebar. The system updates the displayed bus routes according to the applied filters.

3.3.3 Functional Requirements

REQ-1: The system must allow users filter routes based on criteria that judge preferences.
REQ-2: The system must update and display filtered results in real-time as users adjust their preferences.
REQ-3: The system must ensure that multiple filters can be applied simultaneously without errors.
REQ-4: The system must revert to default results when no filters are selected or if filters are cleared.

3.4 Rapid Transit Information

3.2.1 Description and Priority

This feature provides users with detailed information about the Bus Rapid Transit (BRT) and Mass Rapid Transit (MRT) lines in Dhaka, including route maps, schedules, and station details. This is a High priority feature, as it supports both local commuters and foreign visitors who rely on these faster transit options.

3.2.2 Stimulus/Response Sequences

The user navigates to the BRT or MRT section of the website. The system displays route maps (if available), station details, schedules, and operational hours for the selected transit type.

3.2.3 Functional Requirements

REQ-1: The system must provide detailed routes and maps for both the BRT and MRT systems if available.
REQ-2: The system must update users about which lines and stations are presently operational.

3.5 Additional Information and Resources

3.2.1 Description and Priority

This feature offers interactive city maps displaying the city of Dhaka. It also includes additional information such as safety tips, a foreigner guide, and relevant FAQs. This is a Medium priority feature, as it enhances the platform’s usability, particularly for tourists and locals who are new to or unfamiliar with Dhaka's transit system.

3.2.2 Stimulus/Response Sequences

The user selects the interactive map option from the navbar; The system displays a map of Dhaka which can be intuitively navigated and interacted with. The user selects Safety; The system displays guides for staying safe on public transport along with a list of emergency numbers. The user selects Foreigner Guide; The system displays an interactive guide menu providing tips and answers to FAQs for those unfamiliar with the transit system in Dhaka.

3.2.3 Functional Requirements

REQ-1: The system must provide an interactive map of Dhaka that can be intuitively navigated (moved, zoomed in or out, etc.).
REQ-2: The system must include additional resources such as safety tips, a guide for foreign visitors, and an FAQ section.

3.6 Contact and Support

3.2.1 Description and Priority

This feature provides users with the ability to contact the Routewise support team for assistance or inquiries about the platform. It also includes an About page with information about Routewise's mission and team. This is a Low priority feature but important for customer support and building trust with users.

3.2.2 Stimulus/Response Sequences

The user navigates to the Contact Us Page; The system displays a contact form to get in touch with the support team. The user submits a query or feedback through the contact form; The system confirms submission and mails the query to the support team for further action.

3.2.3 Functional Requirements

REQ-1: The system must provide a contact form and have a dedicated email address for user queries.
REQ-2: The system must allow users to submit feedback or report issues via the Contact Us page.
REQ-3: The system must send a confirmation message to users upon submission of queries or feedback.
REQ-4: The system must include an About section with details about Routewise and the development team.

4. External Interface Requirements

4.1 User Interfaces

The user interface (UI) of Routewise is **web-based**. It must be simple, intuitive, responsive, and designed with a **focus on user experience (UX)**, particularly for mobile devices. The platform is expected to accommodate different types of **users**, including daily commuters, tourists, enthusiasts, and occasional public transport users.

The key elements of the user interface are as follows: **Navigation Menu:** The top-level menu must include options for bus route search, local bus route database, BRT/MRT information, interactive maps, and additional resources like guides and FAQs. **Route Form:** The main screen must feature a search form where users can input their current location and destination to search for bus routes. **Results Display:** Search results must be clearly displayed showing available buses on relevant routes. **Bus Pass Form:** There must be a user-friendly form to apply for a bus pass, extending to pages for payment gateway, confirmation, verification, and download. **Interactive Map:** Users should be able to zoom in and out of the map to navigate the city, its bus stops, BRT/MRT stations, and points of interest ("hotspots"). **Contact and Support Page:** Users should have access to a contact form and support resources, including a feedback option and an About page that describes the platform. **Responsiveness:** The user interface must be responsive and work seamlessly across different screen sizes and devices. It should also be **convertible** into a mobile application using third party applications.

4.2 Hardware Interfaces

Since **Routewise** is a web-based platform, the hardware interface requirements are minimal, focusing primarily on compatibility with a wide range of consumer devices. In general, the system should be responsive to and support **any device with internet connectivity** including but not limited to mobile devices, desktop and laptop computers, smart watches, kiosks, and large or ultra-wide screen devices. For dynamic performance, the system could also be updated in the future to interface with the device's GPS hardware to auto-detect the user's current location.

4.3 Software Interfaces

At initial launch, **Routewise's external software interfacing** is limited to **mapping services** like Google Maps to provide an interactive map of the city and **payment gateway** for bus pass payments. Future expansion may include integrating **transit system APIs** where they exist (i.e.: for rapid transit), and third party analytics tools such as **Google Analytics**.

4.4 Communications Interfaces

Routwise requires communication with external systems for real-time updates and user interactions. Key communication interfaces include **internet connection** as the platform is entirely web-hosted, and **email services** for delivering queries received in the Contact Us section to the support team.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

Routewise must maintain high performance standards to handle multiple concurrent users while providing dynamic results. The performance requirements include:

- **Performance in Poor Network Conditions:** The platform must be optimized to function effectively in areas with poor or intermittent network coverage, as users in such areas are likely to be in need of the service. This includes minimizing data consumption, and ensuring that essential features (such as route search and interactive map) remain functional even with limited or fluctuating network access. The system should adapt gracefully to network conditions and prioritize core functionalities for users with limited bandwidth.
- **Response Time:** The system should respond to user requests, such as searching for a route or filtering results, within 1 second. For more complex operations like loading the interactive map, response time should not exceed 3 seconds assuming stable network conditions.
- **Scalability:** The system should support up to 10,000 concurrent users, ensuring that it can handle increased traffic during peak commuting hours without a drop in performance.
- **Availability:** The platform must ensure 99.9% uptime to guarantee reliable access, especially during working hours and peak commuting times. Downtime for maintenance should be scheduled during off-peak hours, and the system should have redundancy in place to avoid unexpected outages.

5.2 Safety Requirements

Although Routewise is not a safety-critical system, it must ensure that users receive reliable and accurate information to avoid any misguidance while using Dhaka's public transport network. Safety requirements include:

- **Data Accuracy:** The system must ensure that all displayed route and data is accurate and up-to-date, as users rely on this information to plan their journeys. Errors or inaccuracies in bus schedules or routes could lead to inconvenience or situations detrimental for both the platform and its users.
- **Emergency Information:** Routewise must prominently display emergency contacts and safety tips in its "Additional Resources" section, ensuring that users can easily access important information in case of emergencies.

5.3 Security Requirements

Ensuring system security is a priority. The platform must protect user data and prevent unauthorized access or disruptions to its services. Security requirements include:

- **Data Encryption and Protection:** All data collected from users such as location or queries must be encrypted or passed through trusted channels to prevent interception by unauthorized parties.
- **Authentication:** The platform should incorporate authentication features such as CAPTCHAs to prevent unwanted access or DDOS attacks.
- **API Security:** All external services used by the platform, such as maps and email services, must be linked or accessed securely.

5.4 Software Quality Attributes

Several key quality attributes will ensure that **Routewise** delivers a high standard of service and reliability to its users. These attributes include:

- **Usability:** The system must be intuitive and easy to use for both local commuters and international visitors. The user interface should be clean and accessible.
- **Portability:** The platform should be accessible from a wide range of devices, including desktops, smartphones, and tablets, without requiring users to download any additional software. The website must work across multiple web browsers and operating systems.
- **Reliability:** The platform must be consistently reliable, with information that is always accurate and up to date. Scheduled update maintenance(s) should be communicated to users in advance to minimize disruption.
- **Maintainability:** The platform must be designed in a way that future updates, such as adding new cities or expanding transport services, can be integrated with minimal downtime or disruption. The architecture should support modular updates and easy debugging.

6. Other Requirements

Additional requirements for Routewise may emerge as the platform evolves and expands its scope. These could include future integrations with payment gateways for purchasing transit tickets, expanded language support, or AI-powered route suggestions. All such requirements will be documented and incorporated into the system's design in future iterations.

Appendix A: Glossary

This section provides definitions and explanations of key terms, acronyms, and abbreviations used throughout the SRS document.

- **Routewise:** The web-based platform providing detailed public transport information for commuters in Dhaka.
- **BRT (Bus Rapid Transit):** A specialized bus service designed to improve capacity and reliability compared to a conventional bus system. Dhaka's BRT system is a planned part of the city's rapid transit services.
- **MRT (Mass Rapid Transit):** The rail-based transit system that operates in Dhaka, aimed at reducing traffic congestion and providing efficient transportation.
- **User:** Refers to any person accessing the Routewise platform for transport-related information. This includes local commuters, international visitors, enthusiasts, and other stakeholders.
- **API (Application Programming Interface):** A set of protocols and tools for building software applications.
- **Scalability:** The ability of the system to handle a growing amount of work, in this case, the number of users accessing Routewise at any given time.
- **Downtime:** The period when the system is unavailable for users due to maintenance or unforeseen issues. Downtime should be minimized and scheduled during off-peak hours.
- **Usability:** The ease with which users can navigate and interact with the Routewise platform without the need for guides or manuals.
- **Modular Updates:** Software updates that can be implemented into the system without overhauling the entire platform, making future enhancements easier to deploy.

- **Interactive Map:** A map feature within the platform that allows users to view transit routes, stations, and stops in a user-friendly, interactive format.
- **Response Time:** The time it takes for **Routewise** to respond to a user request, such as finding a bus route.
- **Emergency Information:** Critical contact numbers and tips provided by Routewise in case of transport-related or personal emergencies.

Appendix B: Issues List

The following section lists open issues and considerations that may require resolution or clarification during the development of the **Routewise** platform. These issues should be monitored and addressed during the implementation phase or subsequent iterations of the platform:

1. **Real-time Data Accuracy:** Ensuring real-time data from local bus and rapid transit authorities is consistently accurate, as inaccurate information could severely impact user experience and trust in the system.
2. **Multilingual Support:** While future updates may include Bengali, the initial release primarily targets local commuters and foreign visitors with content in English.
3. **Coverage Expansion:** Currently, Routewise focuses solely on Dhaka's transport system. Expanding coverage to other cities or regions in Bangladesh will require further updates.
4. **Integration of Restricted APIs:** The system faces limitations in expanding via integrating with APIs related to services such as Dhaka Metro Pass and Rapid Pass, which may require permissions or partnerships with local transit authorities. Doing so can provide an even more comprehensive solution covering not only local buses but also the newer rapid transit systems including features like checking card balance, card top-ups, ride histories, etc.
5. **Analytics Integration:** The platform must eventually integrate user analytics to expand its business model.
6. **System Monitoring and Incident Response:** A clear strategy for monitoring system performance and responding to incidents such as outages or security breaches must be in place.