

Functionality specification

< Project name >

Public Transport Management System

Functionality specification

Version: < version >

<Date>

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Version history

Version	Date	Author	Comment

Document certification

Name	Role	Company	Date	Signature

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Introduction

The Public Transport Management System is a software solution designed to support the planning, operation, monitoring and optimization of public transport services. The system aims to improve service efficiency, reliability and transparency for both transport operators and passengers.

Scope of the project

- A web application for transit operators to manage routes, lines, stops, schedules and service notifications.
- A mobile application for passengers to view schedules, track vehicles in real time, register journeys via NFC, and report incidents
- A backend server system to handle business logic, data storage, and communication between all components
- Integration with IoT/NFC reader devices installed on busses, trams for passenger check in and out
- Multi-language support
- Real time data processing for vehicle tracking and schedule updates
- A reporting dashboard for operators to visualize passenger statistics

What is NOT part of the project:

- Development or manufacturing of the physical NFC hardware devices
- City-wide network infrastructure
- Payment processing or ticketing financial systems
- Integration with third party mapping services

Concepts

1. PTSM: The overarching Public Transportation System
2. Journey Registration: The process where a passenger digitally checks in upon entering a vehicle and checks out upon exiting, using NFC
3. Transit Operator: An authorized staff member who manages the transport system via the web application
4. Passenger: An end user of the public transport service who uses the mobile application
5. IoT/NFC reader: A hardware device installed in vehicles that communicates securely with passenger mobile phones for journey registration
6. Real time Tracking: The live display of a vehicle's geographical position on a map within the mobile application

Role description

- Passenger
 - Uses the mobile application

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- Can view schedules, track vehicles, register journeys via NFC, and report unusual activities
 - Has read only access to general transport information
- Transit Operator
 - Uses the web application
 - Can create, read, update, and delete transport routes, lines and stops
 - Can access and visualize dashboards with passenger statistics

Assumptions and dependencies

- Assumptions:
 1. Passengers have a compatible smartphone with NFC capability and an active internet connection
 2. Vehicles are equipped with functioning IoT/NFC readers and a stable data connection
 3. The necessary backend server infrastructure and hosting provided
- Dependencies:
 1. Availability and correct instalation of NFC hardware in vehicles
 2. Stable cellular/GPS network coverage for real time vehicle location data
 3. Accurate and up to date base geographical data

List of requirements

1. Passenger Real time information viewing
2. NFC based Journey registrarion
3. Incident reporting
4. Transit route management
5. Service Notification management
6. Passenger statistics visualization

Requirements related to functionality

1.Passenger Real-Time Information Viewing

Descriptoin:

The mobile application shall allow passengers to view real time transit schedules and vehicle positions for selected stations or lines.

Actor: Passenger

Steps:

1. The passenger opens the mobile application
2. The passenger selects a specific station, line or a bus stop they are interested in.
3. The Application sends a request to server for the real time data related to the selection
4. The server processes the request, queries live vehicle locations and schedule data and returns it
5. The application displays the information to the passenger(Schedule View, Map view)

2. NFC-Based Journey Registration

Description:

The mobile application, in tandem with an on vehicle NFC reader, shall allow passengers to securely register their entry and exit from public transport vehicle.

Actors: Passenger

Steps:

1. The passenger boards the vehicle
2. The passenger opens the mobile application and navigates to the Check in function
3. The passenger holds their phone near the vehicle's NFC reader
4. The mobile app and the NFC reader establish a connection
5. The app transmits a secure token containing passenger's ID and a timestamp to the reader
6. Reader relays data to the central server
7. Server validates the token and records passenger's entry
8. Mobile app receives the confirmation
9. Process is identical when passenger exits

3. Incident Reporting

Description:

Mobile application shall provide passengers with a functionality to report unusual activities or issues related to the service

Actor: Passenger

Steps:

1. From the main menu or a dedicated section, the passenger selects Report an Issue
2. The passenger is presented with a form. Where they can select an issue type from a list
3. Passenger can optionally add text, take a photo and tag their current location
4. Upon submitting the report the application sends the data
5. The server logs the report

4. Transit Route Management

Description:

The web application shall allow transit operators to fully manage public transport routes, lines and their associated stops

Actor: Transit Operator

Steps:

1. The operator logs into the web applications administration panel
2. They navigate to the Route Management Network planning section
3. They select „Create new Line“
4. They put basic line information
5. Using an interactive map or a list, they define the sequence of stops for the line
6. Assign estimated travel times between stops
7. Save the new line

Steps (Modifying a Stop):

1. The operator searches for or selects an existing bus/tram stop in the system.
2. They can edit its properties: name, exact geographical coordinates GPS, accessibility notes
3. Upon saving, all lines that use this stop are automatically updated with the new information.

5. Passenger Statistics Visualization

Description:

Web application shall provide transit operators with a dashboard to visualize statistics, such as the number of passengers using specific lines over time.

Actor: Transit Operator

Steps:

1. Operator logs into web application and navigates to the Statistics dashboard
2. Dashboard presents an overview. Operator can apply filters: time range, specific line, specific stop
3. Operator can export these reports for further analysis

6. Service notification management

Description:

Web application that allows transit operators to create, publish and manage notification regarding traffic conditions

Actor: Transit operator

Steps:

1. Operator logs into web applications administration panel
2. They go to notification section
3. They click on Create New Notification
4. They fill out the notification form -Headline-Content-Severity Level-Affected Lines-Validity Period
5. They publish the notification
6. System publishes notification

Requirements related to characteristics

Security, usability/accessibility design, reliability, performance

1. Security

All communication between NFC readers and the central server must be encrypted

Passenger identification tokens used for journey registration must be secured

RBAC must be implemented to ensure:

-Passenger have read-only access to schedules and reporting functions

-Transit operators have full CRUD permissions

Incident reports containing photo/location data must be stored securely

2. Usability/Accessibility Design

Mobile application must support

-Languages: English, German, Italian, French

-Intuitive navigation

Web application must support

Languages: English and German

Responsive design for use on desktop and tablet devices

Keyboard navigation and screen reader compatibility

Both applications must have a consistent visual identity

3. Reliability

System availability must be 99.9%

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Real time vehicle tracking must have a maximum data latency of 5s

The backend must implement database replication and failover mechanisms to prevent data loss

4. Performance

Response time for all user-facing operations must be under 500ms under normal load