FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER ENGINEERING

COURSE CODE/TITLE: CEF 440/ INTERNET PROGRAMMING AND MOBILE PROGRAMMING

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PROJECT TITLE:

REQUIREMENT ANALYSIS REPORT FOR THE DESIGN AND IMPLEMENTATION OF A ROAD SIGN AND ROAD STATE MOBILE NOTIFICATION APPLICATION

GROUP 9

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1. REVIEW AND ANALYSIS OF GATHERED REQUIREMENTS:

We reviewed the raw requirements gathered from stakeholders including road users (drivers, cyclists, pedestrians), traffic management authorities, and road maintenance agencies. The requirements were analyzed based on **completeness**, **clarity**, **technical feasibility**, and **dependency relationships**.

a. COMPLETENESS:

The requirements cover all essential aspects of the application: road sign notifications, road state alerts, user profile management, location-based services, potential offline capabalities, admin management and notification preferences.

b. CLARITY:

Most requirements are clearly stated, but some ambiguities exist around update frequency of road state data and types of supported road signs.

c. TECHNICAL FEASIBILITY:

We assessed if the requirements can be implemented with the available technology and timeline. Implementation proved feasible with existing GPS, mobile push notification systems, and backend server technologies. Real-time data integration with road authorities might pose a technicial challenge and high infrastructure cost.

d. DEPENDENCY RELATIONSHIPS:

We identified if the requirements were dependent on each other. The requirements for displaying road sign notification depends on real-time GPS tracking; The requirements for displaying road state alerts depend on server updates from road agencies.

2. IDENTIFICATION OF INCONSISTENCIES, AMBIGUITIES AND MISSING INFORMATION:

Based on the analyzed requirements, the followoing were identified issues:

a. INCONSISTENCIES:

Some conflicting requirements were identified such as:

- Some stakeholders expect voice-based alerts while others expect visual pop-up notifications.

- Some stakeholders suggested the app should support offline mode with cached maps and signs, while others emphasized the importance of always-online, real-time updates — a conflict in data delivery expectations.

b. **AMBIGUITIES:**

It is unclear how the system will distinguish between temporary road signs (e.g., event detours, construction signs) and permanent road signs. The frequency and method of updating such temporary data need clarification.

c. **MISSING INFORMATION:**

A variety of details were left unanswered. Some include:

- No explicit details were gathered on how multilingual support will be handled, which is critical in regions with diverse languages (e.g., English and French in Cameroon).

- The gathered requirements lack specifics on how frequently road agency admins are expected to update the road state database (daily, weekly, or event-driven updates?).

- No clear indication of how user-reported issues (e.g., newly identified road hazards) will be verified or moderated before appearing in the system.

3. PRIORITIZATION OF REQUIREMENTS BASED ON IMPORTANCE AND FEASIBILITY:

Feasibility is the process of determining if the identified requirements can be realistically achieved within the given constraints and resources. Here, we worked with the stakeholders to prioritize the requirements. We used a common approach to categorize these requirements under **HIGH, MEDIUM** and **LOW** based on factors like user needs, implementation effort etc.

a. **HIGH:**

These requirements are critical("must-have") for the core functionality and success of the moible notification application. Failure to implement these requirements would result in a significantly less useful or even unusable application.

b. **MEDIUM:**

These requirements are "good-to-have" and enhances the working principle of the application. They are addressed after high-priority features.

c. **LOW:**

These requirements are "nice-to-have" and are addressed last or deferred.

The table below is a categorized summary of the application's requirements.

REQUIREMENT	IMPORTANCE	FEASIBILITY	PRIORITY
Real-time road sign notifications	High	High	High
Road state alerts	High	High	High
User Customization of Notification Preferences	High	High	High
User Profile Management	Medium	Medium	Medium
Admin dashboard for road agency updates	Medium	Medium	Medium
Reporting new road issues by users	Medium	Medium	Medium
Offline access to a limited set of data	Medium	Medium	Low
Notification settings customization (sound, vibration)	Medium	Low	Medium
Voice-based alerts	Medium	Low	Low
Pop-Up Notitifications	High	Medium	Medium
In-app feedback/reporting system	Low	Low	Low

4. CLASSIFICATION OF REQUIREMENTS:

The application's requirements were classified into two main categories: **Functional** and **Non-Functional Requirements.**

a. **FUNCTIONAL REQUIREMENTS:**

These describe what the application should do. They define the specific actions, behaviors or functions that the application must perform. They include:

- ❖ Provide real-time road sign notifications to users.
- ❖ Provide real-time notifications about road road states(road closure, traffic congestion etc).
- ❖ Allow users to configure their notification preferences.
- ❖ Allow users manange their profiles and notification settings.
- ❖ Allow users to report new road hazards or sign issues.

❖ Allow road agency admins to input/update road state data.

❖ Provide map overlays to show road sign positions and real-time alerts.

❖ Be compatible with Android and iOS platforms.

b. **NON-FUNCTIONAL REQUIREMENTS:**

These describe how well the application should perform its functions. They define the quality attributes and constraints of the system. They are crucial for the overall user experiece and success of the application. They include:

❖ **Performance:** The application should deliver notifications within 3 seconds of detecting an event.

❖ **Usability:** The application should have an intuitive and easy-to-navigate interface.

❖ **Reliability:** The application should be stable and function correctly under normal usage conditions.

❖ **Security:** The application should ensure user data privacy and follow data protection standards.

❖ **Scalability:** The application should be able to handle a growing number of users and data.

❖ **Maintainability:** The codebase should be well-structured and easy to maintain and update.

❖ **Portability:** The application should be compatible with target operating systems(e.g android and iOS).

5. DEVELOPMENT OF THE SOFTWARE REQUIREMENT SPECIFICATION(SRS):

The Software Requirement Specification(SRS) is a comprehensive document that describes all aspects of the intended functionality of a software system. It is a blueprint detailing all the analyzed and classified requirements(functional and non-functional) in a structured format. This SRS document is structured as follows:

A. **INTRODUCTION:**

This section is made up of the **purpose, scope, definitions** and **references.**

B. **OVERALL DESCRIPTION:**

This section contains the **product perspective, product functions, user characteristics** and the **operating environment.**

C. SPECIFIC REQUIREMENTS:

This is made up of the **Functional**(which are detailed descriptions of what the software should do) and **Non-Functional**(these are quality attributes like performance, security, usability, reliablity and maintainability) requirements.

D. EXTERNAL INTERFACE REQUIREMENTS:

This section includes descriptions of user interfaces, hardware interfaces, software interfaces and communication interfaces. e.g API connections to road agencies, GPS modules and notification services.

E. CONSTRAINTS AND ASSUMPTIONS:

This section highlights the limitations and presumptions of the system.

F. APPENDICES:

This section provide essential supplementary information that improves understanding of the main content. It includes:
  - A **Glossary of Terms,** which defines key terminology leveraged throughout the document ensuring the clarity of all stakeholders.
  - A **List of Acronyms** to avoid confusion.

6. VALIDATION OF REQUIREMENTS WITH STAKEHOLDERS:

After completing the requirements gathering phase, we conducted validation activities to ensure alignment and agreement with our stakeholders' needs and expectations. These activities involved:

  a. **REVIEW MEETINGS:**

These are structured meetings where stakeholders(drivers, traffic authorities, government agencies and the development team) come together to review the documented requirements to identify errors, inconsistencies, ambiguities, omissions and misunderstandings in the requirements.

b. **USE-CASE REVIEWS:**

Here, documented use cases and user scenarios were examined to ensure that the functional requirements adequately support the intended user interactions. This process validates the completeness and correctness of functional requirements from a user's perspective.

c. **SURVEYS AND QUESTIONNAIRES:**

This included distributing structured sets of questions to a larger group of potential stakeholders to gather their opinions and feedback on the proposed requirements.

d. **INTERVIEWS AND FOCUS GROUPS:**

This involves conducting one-on-one conversations(interviews) with key stakeholders to gather in-depth feedback on their needs, expectations and concerns related to the proposed application.

All stakeholders **reviewed and approved** the initial SRS document with minor revisions proposed, which have been incorporated.

7. **CONCLUSION:**

The requirement analysis phase provided a comprehensive understanding of stakeholder expectations, technical constraints, and system functionalities for the Road Sign and Road State Mobile Notification Application. This report ensures a solid foundation for the design and implementation phases ahead.