Software Requirements Specification

RealEstate Hub – A Smart Property Buying and Selling Platform

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1. Introduction

1.1 Purpose

The purpose of RealEstate Hub is to create a seamless, user-friendly platform for buying and selling properties. The platform aims to address the inefficiencies in the current real estate market by providing a centralized, mobile-first solution that enhances communication between buyers and sellers. Additionally, the platform will offer an optional premium virtual reality (VR) feature for high-end property listings, allowing buyers to explore properties in an immersive way. The inclusion of an AI-driven recommendation system will further personalize the user experience by suggesting properties based on user preferences and browsing history.

1.2 Document Conventions

This document follows the IEEE standards for Software Requirements Specifications (SRS). Each system feature is listed in order of priority, with higher-priority features being necessary for the implementation of subsequent features. Requirements within each feature are of equal priority but inherit the priority of their parent feature.

1.3 Intended Audience and Reading Suggestions

- **Developers:** Interested in the technical implementation of the platform, including the AI recommendation system and VR feature.
- **Project Managers:** Need an overview of the project scope, timelines, and resource allocation.
- **Users:** Both buyers and sellers will want to understand how to use the platform, its features, and its benefits.

- **Testers:** Require information on testing requirements, expected behaviors, and potential edge cases.
- **Documentation Writers:** Need a deep understanding of the platform to create user-friendly guides and manuals.

1.4 Product Scope

RealEstate Hub is the first mobile platform designed to simplify property transactions. It includes features such as user registration, property listings, search and filter options, direct messaging, and a property verification system. The platform also offers an optional premium VR feature for high-end property listings and an AI-driven recommendation system to personalize the user experience. The platform is designed to be scalable and future-ready, with the potential for additional features such as AI-driven property recommendations.

1.5 References

1. IEEE Standard 1016-1998, IEEE Recommended Practice for Software Requirements Specifications.

2. React.js Documentation: https://reactjs.org/

3. Node.js Documentation: https://nodejs.org/

4. MongoDB Documentation: https://www.mongodb.com/

5. Three.js Documentation: https://threejs.org/

6. Firebase Documentation: https://firebase.google.com/

2. Overall Description

2.1 Product Perspective

RealEstate Hub is a standalone product designed to address the inefficiencies in the real estate market. It provides a centralized platform for property transactions, with a focus on mobile accessibility and user-friendly features. The platform integrates advanced technologies such as AI and VR to enhance the user experience.

2.2 Product Functions

- **User Registration & Authentication:** Secure account creation for buyers and sellers.
- **Property Listings:** Users can upload property details, images, and pricing.
- **Search & Filter Options:** Buyers can browse properties based on price, size, and other criteria.
- **Direct Messaging:** Built-in chat system for buyers and sellers to communicate.
- **Property Verification System:** Ensures the authenticity of listings through user verification.

- **Mobile Application:** The platform is optimized for both web and mobile use.
- **Premium VR Feature:** Optional VR showcase for high-end property listings.
- **AI-Driven Recommendation System:** Suggests properties based on user preferences and browsing history.

2.3 User Classes and Characteristics

- **Buyers:** Individuals looking to purchase properties. They range from first-time buyers to experienced investors.
- **Sellers:** Individuals or agencies looking to list properties for sale. They may include homeowners, real estate agents, and property developers.
- **Administrators:** Responsible for managing the platform, verifying property listings, and ensuring system security.

2.4 Operating Environment

- **Hardware Platform:** The platform will run on devices that support web and mobile applications, including smartphones, tablets, and desktops.
- **Operating Systems:** Compatible with Windows, macOS, Linux, iOS, and Android.
- **Software Components:** React.js (web), React Native (mobile), Node.js (backend), MongoDB/PostgreSQL (database), Firebase/Clerk (authentication), AWS S3 (cloud storage), Three.js (VR).

2.5 Design and Implementation Constraints

- The platform must be mobile-first, ensuring optimal performance on mobile devices.
- The AI recommendation system must be scalable to handle large datasets.
- The VR feature must be optional and only available for premium listings.
- The platform must comply with data protection regulations (e.g., GDPR).

2.6 User Documentation

User documentation will be available online, including guides on how to register, list properties, use the search and filter options, and access the premium VR feature. Documentation will be updated with each new release.

2.7 Assumptions and Dependencies

- Users will have internet access to use the platform.
- Sellers will provide accurate property details and images.
- The AI recommendation system will rely on user data to provide personalized suggestions.
- The VR feature will require compatible devices for optimal performance.

3. External Interface Requirements

3.1 User Interfaces

- **Web Interface:** A responsive web application built with React.js.
- **Mobile Interface**: A mobile app built with React Native, optimized for iOS and Android.
- **VR Interface:** A 3D property showcase built with Three.js, accessible via the web or mobile app.

3.2 Software Interfaces

- **Backend:** Node.js with Express.js for handling API requests.
- **Database:** MongoDB/PostgreSQL for storing user data, property listings, and transaction history.
- **Authentication:** Firebase/Clerk Auth for secure user login and management.
- **Cloud Storage:** AWS S3 for hosting property images and VR assets.

3.3 Communications Interfaces

- The platform will use HTTPS for secure communication between the client and server.
- The messaging system will use WebSocket for real-time communication between buyers and sellers.

4. System Features

Domain analysis, expert interviews, brainstorming sessions, and closed-ended surveys were conducted to identify and prioritize the system features for RealEstate Hub. The following is a comprehensive summary of all the project features organized based on priority and functional hierarchy. A preceding functional requirement must be satisfied before moving to the next.

Note: Wiegers's Prioritization Technique was employed to calculate the priority value of each system feature. The relative factors considered, and their associated weights are:

- **Benefit**: 2
- **Cost**: 1
- **Risk**: 1

The formula for priority calculation is:
Value = (Benefit * Benefit Weight)
Priority = Value / [(Cost% * Cost Weight) + (Risk * Risk Weight)]

4.1 User Registration & Authentication

- Priority: 1.0
- Benefit: 10
- Cost: 2, 10%
- Risk: 1, 5%

- **Description: Secure account creation and login for buyers and sellers.**

- **Functional Requirements:**
    - **REQ_01:** Users must be able to register using email and password.
    - **REQ_02:** Users must be able to log in securely using Firebase Auth.

4.2 Property Listings

- Priority: 0.95
- Benefit: 9
- Cost: 3, 15%
- Risk: 2, 10%
- Description: Sellers can upload property details, images, and pricing.
- **Functional Requirements:**
    - **REQ_03:** Sellers must be able to create and edit property listings.
    - **REQ_04:** Listings must include property details, images, and pricing.

4.3 Search & Filter Options

- Priority: 0.90
- Benefit: 8
- Cost: 4, 20%
- Risk: 3, 15%
- Description: Buyers can search, and filter properties based on price, size, and other criteria.
- **Functional Requirements:**
    - **REQ_05:** Buyers must be able to search for properties using keywords.
    - **REQ_06:** Buyers must be able to filter properties based on price, size, and location.

4.4 Direct Messaging

- Priority: 0.85
- Benefit: 7
- Cost: 5, 25%
- Risk: 4, 20%
- Description: Buyers and sellers can communicate directly through a built-in chat system.
- **Functional Requirements:**

- **REQ_07:** Users must be able to send and receive messages in real-time.
- **REQ_08:** The chat system must support text and image messages.

4.5 Property Verification System

- Priority: 0.80
- Benefit: 6
- Cost: 6, 30%
- Risk: 5, 25%
- Description: Ensures the authenticity of property listings through user verification.
- **Functional Requirements:**
  - **REQ_09:** Sellers must verify their identity before listing properties.
  - **REQ_10:** Listings must be reviewed by administrators before being published.

4.6 Mobile Application

- Priority: 0.75
- Benefit: 5
- Cost: 7, 35%
- Risk: 6, 30%
- Description: The platform is optimized for mobile devices using React Native.
- **Functional Requirements:**
  - **REQ_11:** The mobile app must support all features available on the web platform.
  - **REQ_12:** The app must be compatible with iOS and Android.

4.7 Premium VR Feature

- Priority: 0.70
- Benefit: 4
- Cost: 8, 40%
- Risk: 7, 35%
- Description: Optional VR showcase for high-end property listings.
- **Functional Requirements:**
  - **REQ_13:** Sellers must be able to upload 3D models for premium listings.
  - **REQ_14:** Buyers must be able to view properties in VR using compatible devices.

4.8 AI-Driven Recommendation System

- Priority: 0.65
- Benefit: 3
- Cost: 9, 45%
- Risk: 8, 40%
- Description: Suggests properties based on user preferences and browsing history.
- **Functional Requirements:**
    - **REQ_15:** The system must analyze user behavior to generate personalized recommendations.
    - **REQ_16:** The system must update recommendations in real-time based on user interactions.

4.9 Payment Integration (Future Release)

- Priority: 0.60
- Benefit: 2
- Cost: 10, 50%
- Risk: 9, 45%
- Description: Integration with popular payment gateways for seamless transactions.
- **Functional Requirements:**
    - **REQ_17:** Users must be able to make payments securely through the platform.
    - **REQ_18:** The system must support multiple payment methods (e.g., credit card, Raast Payment).

4.10 Augmented Reality (AR) Integration (Future Release)

- Priority: 0.55
- Benefit: 1
- Cost: 11, 55%
- Risk: 10, 50%
- Description: Enhanced property visualization using AR for premium listings.
- **Functional Requirements:**

- **REQ_19:** Sellers must be able to upload AR-compatible models for premium listings.
- **REQ_20:** Buyers must be able to view properties in AR using compatible devices.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

- The platform must handle up to 10,000 concurrent users.
- The AI recommendation system must generate suggestions within 2 seconds.

5.2 Security Requirements

- User data must be encrypted using AES-256.
- The platform must comply with GDPR regulations.

5.3 Software Quality Attributes

- **Maintainability:** The codebase must be modular and well-documented.
- **Scalability**: The platform must be able to handle increasing numbers of users and listings.
- **Usability:** The platform must be intuitive and easy to use for both buyers and sellers.

5.4 Business Rules and Project Policy

- The platform will be monetized through premium features such as VR showcases.
- User data will not be sold to third parties.

6. Other Requirements

6.1 Community Support

- A dedicated support forum will be available for users to ask questions and report issues.
- Regular updates and new features will be announced through the platform's blog.

6.2 Ecosystem Support

- The platform will integrate with popular payment gateways for future monetization.
- The AI recommendation system will be compatible with third-party data sources.

6.3 Future Releases (Roadmap)

- Integration with AR for enhanced property visualization.
- Expansion of the AI recommendation system to include predictive analytics.

Appendix A: Glossary

- **AI (Artificial Intelligence):** A system that analyzes user behavior to provide personalized recommendations.

- **VR (Virtual Reality):** A 3D immersive experience for viewing properties.
- **GDPR (General Data Protection Regulation):** A regulation governing data protection and privacy in the EU.

Appendix B: Analysis Models

B.1 UML Diagram

- **Class Diagram**:
  - The Class Diagram of the project is in the PDF, which has also been submitted along with the SRS document.
- **B.2 Data Flow Diagrams**
  - **Level 0 DFD**: The Level 0 Data flow Diagram of the project is in the PDF, which has also been submitted along with the SRS document.
  - **Level 1 DFD**: The Level 1 Data flow Diagram of the project is in the PDF, which has also been submitted along with the SRS document.

Appendix C: To Be Determined List

- The exact throughput of the AI recommendation system is to be determined.
- The storage scheme for VR assets is to be decided (e.g., AWS S3 vs. Firebase/Clerk Storage).