Software Design Specifications

AutoConnect

Version: [1.0]

Project Code	
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Co Supervisor	
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Document History

Version	Name of Person	Date	Description of change
1.0	Ishaqullah Siddiqui	22 Sep,2023	Document Created
1.0	Ishaqullah Siddiqui	30 Sep,2023	Added ER Diagram and Data Dictionary
1.0	Sarim Latif Khan	1 Oct,2023	Added Introduction
1.0	Muhib Ahmed	2 Oct, 2023	Added Design Considerations
1.0	Ishaqullah Siddiqui	2 Oct, 2023	Added System Architecture
1.0	Muhib Ahmed	5 Oct ,2023	Added Activity and State Machine Diagram
1.0	Muhib Ahmed	5 Oct,2023	Added Sequence and Communication Diagram

Distribution List

Name	Role
Mr.Ubaid Aftab Chawala	Supervisor
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Document Sign-Off

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Definition of Terms, Acronyms and Abbreviations

Term	Description
ASP	Active Server Pages
DD	Design Specification

Table of Contents

1   Introduction

1.1   Purpose of Document

The purpose of this Software Design Specification (SDS) document is to provide a detailed overview of the design aspects of the "AutoConnect" automotive e-commerce platform. This document aims to define the architecture, components, and interactions within the system, offering insights into the software design decisions and considerations made during the development process.

1.2   Intended Audience

The intended audience for this SDS document includes:

Project Supervisor: Project supervisor or advisors who will assess and guide the development process. This document serves as a reference for them to evaluate the design rationale and technical decisions made during the project.

Evaluation Committee: Members of the evaluation committee responsible for assessing and grading your final year project. This document provides them with insights into the design principles and methodologies applied in the development of the "AutoConnect" platform.

Fellow Students: Other students and peers who may be interested in understanding the design aspects of your project. This document can serve as a valuable resource for knowledge sharing within the academic community.

Developers: This document will serve as a reference for developers during the implementation phase and future discussions about the project. It helps ensure consistency in the development process and serves as a guide for making informed design decisions.

1.3   Document Convention

Font: Calibri Light
Font size:
    Heading: 16px
    Subheading: 14px
    Description: 12px

1.4 Project Overview

The "AutoConnect" project aims to revolutionize the vehicle buying and selling experience in the Pakistani automotive market. Faced with challenges posed by market fluctuations, the project seeks to develop an adaptive e-commerce platform. This platform dynamically adjusts to market conditions, empowering individuals to secure optimal deals for their vehicles. The key features include a Negotiation Chat Bot and Video Calling functionality, streamlining transactions for buyers and sellers. The project's inception stems from the recognition of challenges in Pakistan's automotive sector, supported by extensive market research. The platform, still in the planning phase, emphasizes a user-centric approach and leverages advanced technology features. "AutoConnect" has the potential to transform the automotive e-commerce landscape, offering a seamless and empowering experience for users.

1.5 Scope

1. Project Justification:
   - Need: The project is needed to address the challenges in the Pakistani automotive market characterized by market fluctuations, complex transactions, and the absence of a user-centric platform. Buyers and sellers require a secure, efficient, and transparent solution to trade vehicles seamlessly.

2. Brief Description of Project Products/Services:
   - Products/Services: The project will produce an innovative e-commerce platform, "AutoConnect" tailored to the Pakistani automotive market. It will offer features such as live video calling, a Smart Negotiation Bot, and a vibrant community for vehicle enthusiasts.

3. Summary of Project Deliverables:
   - Deliverables: The project will deliver a fully functional web-based application, inclusive of user accounts, live video calling, negotiation chatbot, user reviews, and a robust database of vehicles. Additionally, the project will provide comprehensive documentation and a user support system.

4. Statement of Project Success Criteria:
   - Success Criteria: The project will be deemed successful if it results in increased user satisfaction, secure and efficient vehicle transactions, high user engagement in the community, and a positive impact on the Pakistani automotive market. It should also comply with all relevant legal and regulatory standards.

5. Project Exclusion:
   - Exclusions: The project will not involve the development of a mobile application, the creation of the entire e-commerce ecosystem (e.g., payment processing systems), or the handling of data quality and access related to third-party data providers.The project will not be cross platform however it can be accessed on mobile devices through browsers.

6. Constraints:

 - Constraints: Constraints include budget limitations, time constraints for project completion, available technology infrastructure, and compliance with changing legal and regulatory requirements in the automotive industry.

7. Assumptions:

 - Assumptions: It is assumed that users will actively engage in the community, that the provided third-party data sources will be reliable, and that market conditions will continue to experience fluctuations. If these assumptions are false, the project may need to adapt its strategies accordingly.

8. Dependencies:

 - Dependencies: The project is dependent on external agents such as third-party data providers for vehicle history information and may require user access to devices with cameras for live video calls. Furthermore, the project may depend on stable internet connections for live video calls to function effectively.

2   Design Considerations

2.1   Assumptions and Dependencies

2.1.1   Assumptions:

User Interface Consistency: It is assumed that the user interface design elements, once finalized, will maintain consistency across different modules and features to provide a cohesive and intuitive user experience.
Scalability: The system design assumes the need for scalability to accommodate potential increases in user traffic, data volume, and the addition of new functionalities without compromising performance.
Cross-Browser Compatibility: The design assumes that the user interface will be compatible with major web browsers to ensure a consistent experience for users regardless of their chosen browser.

2.1.2   Dependencies

Third-Party API Integration: The design is dependent on the successful integration of third-party APIs for functionalities such as live video calling, dialog flow apis etc.

Database Management System (DBMS): The design depends on the choice of an efficient and scalable DBMS to manage user data, transaction records, and other critical information, ensuring data integrity and optimal performance.

Technology Stack Compatibility: The design depends on the compatibility and seamless integration of the chosen technology stack components (front-end frameworks, back-end technologies, etc.) to facilitate efficient communication and data flow between system modules.

2.2   Risks and Volatile Areas

Emerging Technologies: The rapid evolution of technologies in the automotive and e-commerce sectors may introduce new features and capabilities that could impact the system design

Market Dynamics: Changes in market trends, user preferences, or regulatory requirements within the automotive industry may necessitate adjustments to the system's features and functionalities.

User Feedback and Preferences: User feedback and preferences, gathered through the platform's usage, may lead to modifications in the user interface and additional features for improved user satisfaction.

Competitive Landscape: Innovations introduced by competitors or changes in industry standards may prompt the need for continuous improvement and adaptation in the system design.
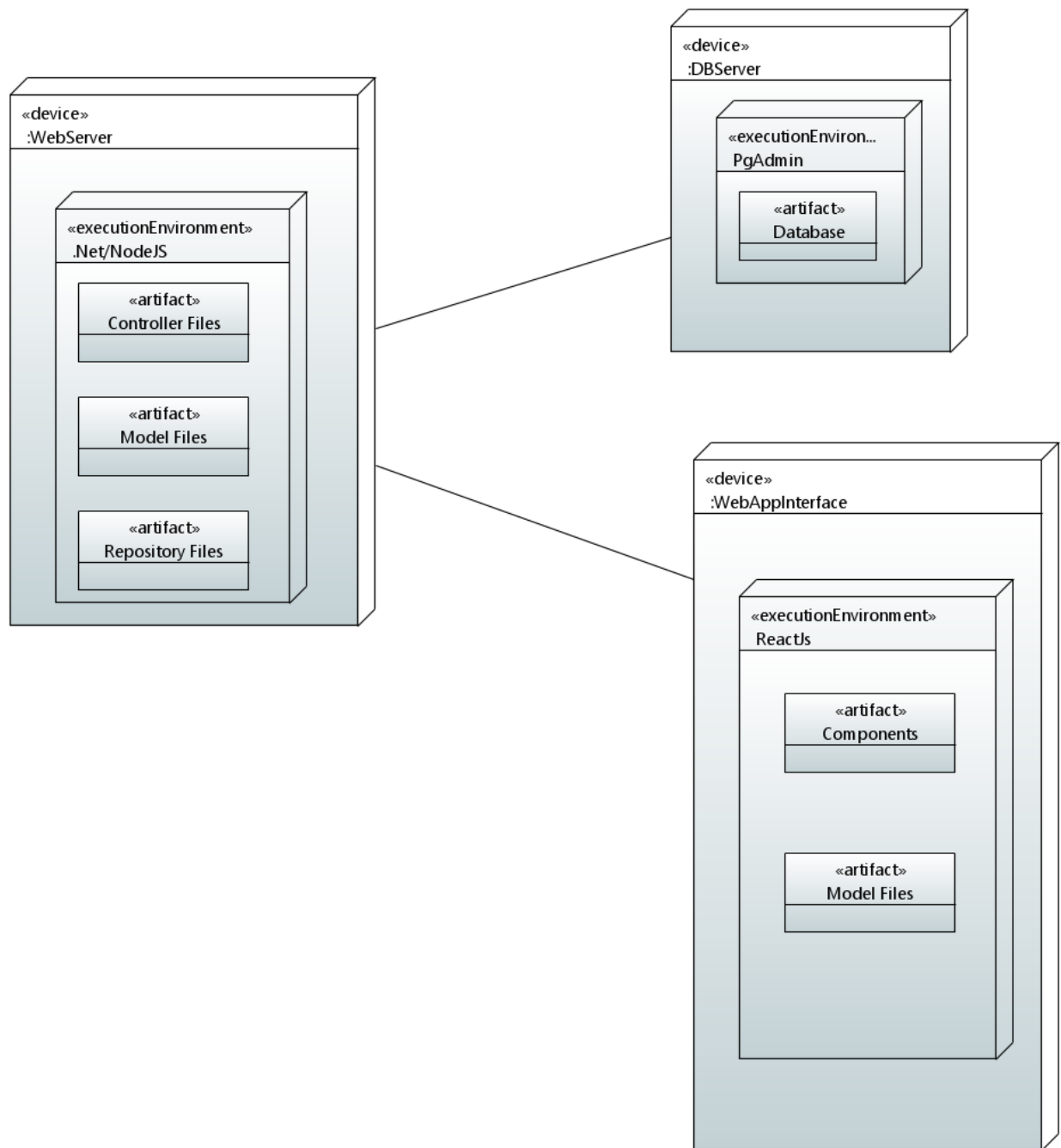
3   System Architecture
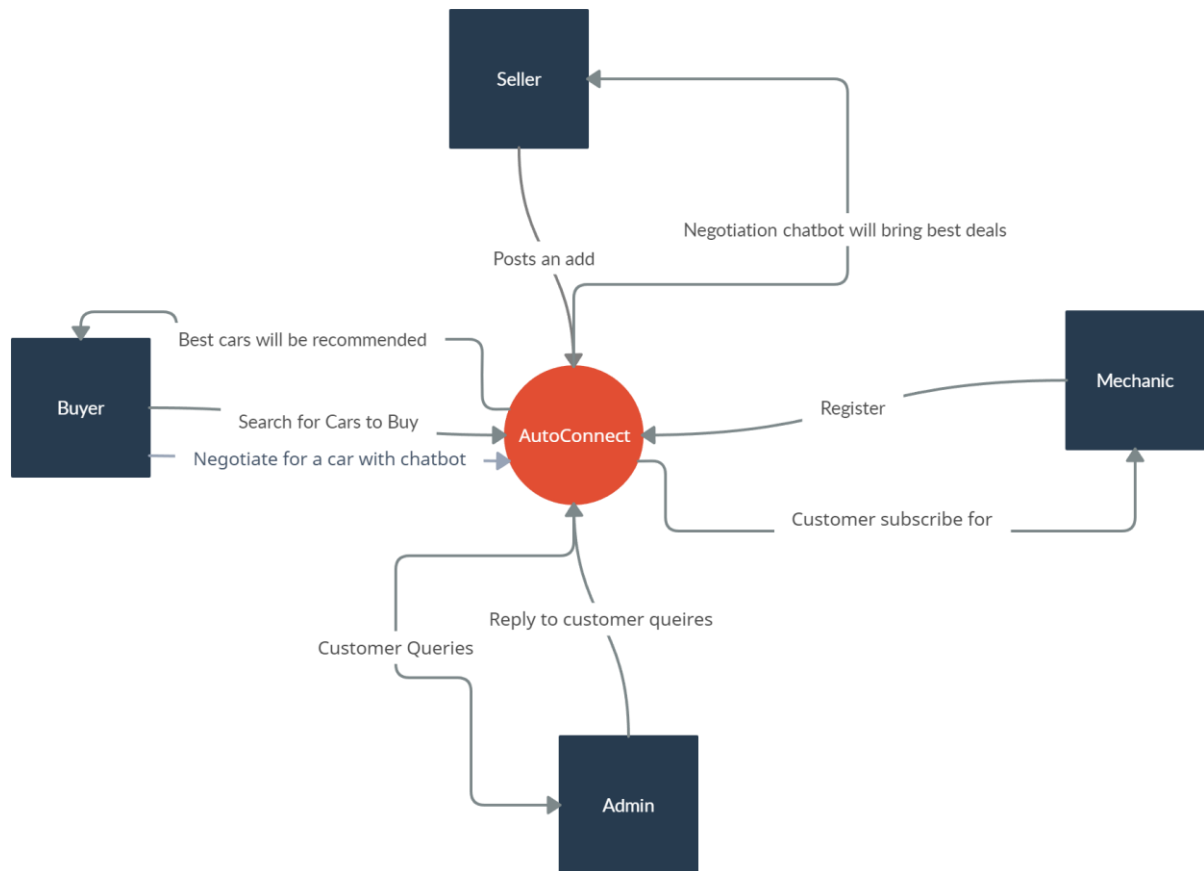
3.1   System Level Architecture

3.1.1   Component Diagram
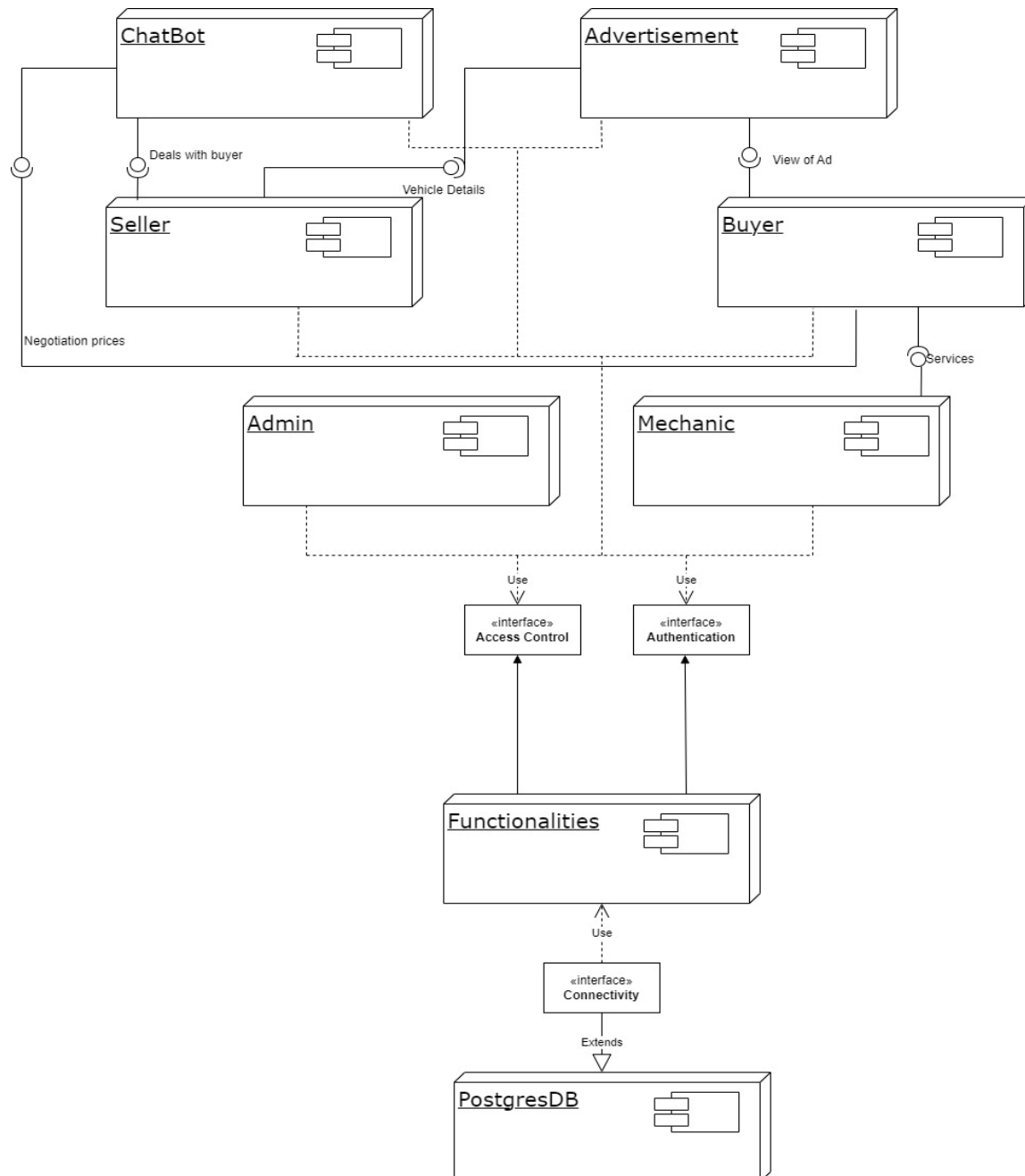
3.1.2 Deployment Diagram

3.2   Software Architecture

4   Design Strategy

4.1   Future System Extension or Enhancement:

Strategy: Modular and Extensible Architecture
Reasoning:
The design prioritizes a modular and extensible architecture to facilitate future system extension or enhancement. Each module is designed as an independent unit with well-defined interfaces, allowing for the seamless integration of new functionalities. This approach aligns with the goal of adaptability, enabling the system to evolve with emerging technologies and changing user requirements.
Trade-offs:
While this strategy promotes flexibility, it requires careful consideration of dependencies between modules. A balance must be maintained to avoid excessive coupling, ensuring that modifications in one module do not unduly impact others.

4.2   System Reuse:

Strategy: Component-Based Design
Reasoning:
The system employs a component-based design approach, where reusable components are created to encapsulate specific functionalities. This strategy enhances system reuse by allowing components to be leveraged in different contexts, contributing to code efficiency and maintainability.
Trade-offs:
The challenge lies in designing components that are generic enough for reuse while being specific enough to meet the needs of different modules. Striking the right balance is crucial to avoid overly complex or overly specialized components.

4.3   User Interface Paradigms

Strategy: Progressive Enhancement with Device-Specific Optimization
Reasoning:
The user interface design adopts a progressive enhancement approach with a focus on device-specific optimization. Instead of aiming for responsiveness across all devices, the strategy involves providing a core functional experience that progressively enhances based on the user's device capabilities. This approach allows for tailored optimization, ensuring an optimal experience on each device category.

Trade-offs:

1. Device-Specific Effort: Designing and optimizing for specific devices may require additional effort compared to a one-size-fits-all responsive design. This could include tailoring layouts and interactions for different screen sizes and resolutions.

2. Potential Limited Consistency: Progressive enhancement may result in variations in the user interface across devices. While optimizing for each device's strengths, there might be a trade-off in maintaining a consistent visual experience.

4.4   Data Management (Storage, Distribution, Persistence):

Strategy: Scalable and Distributed Data Architecture

Reasoning:

The system adopts a scalable and distributed data architecture to manage the storage, distribution, and persistence of data efficiently. This strategy supports the scalability goal, allowing the system to handle increasing data volumes while maintaining performance. Utilizing distributed databases enhances fault tolerance and reliability.

Trade-offs:

Complexity in managing distributed data systems introduces challenges related to consistency and coordination. Trade-offs involve choosing the appropriate level of consistency and partitioning strategies.

4.5   Concurrency and Synchronization:

Strategy: Asynchronous and Event-Driven Architecture

Reasoning:

The design incorporates an asynchronous and event-driven architecture to handle concurrency and synchronization. This strategy enhances system responsiveness by allowing non-blocking execution. Events and messages facilitate communication between different components, promoting efficient handling of concurrent processes.
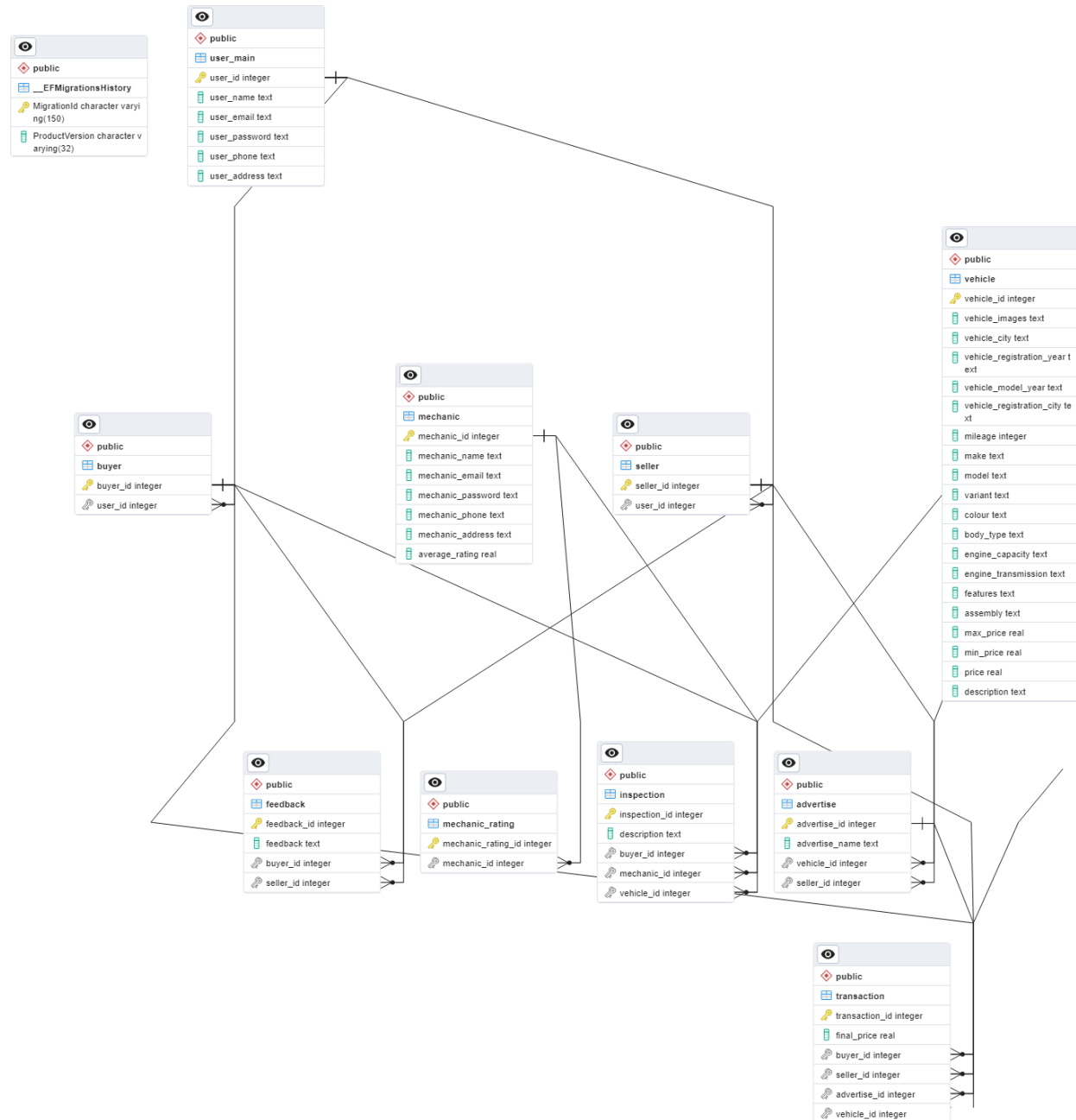
Trade-offs:

While asynchronous processing improves responsiveness, it introduces potential challenges in terms of debugging and understanding the flow of events. Careful design and documentation are essential to mitigate these trade-offs.

5   Detailed System Design

5.1   *Database Design*

5.1.1   ER Diagram

5.1.2 Data Dictionary

5.1.2.1 Buyer

Buyer	
Name	Buyer
Alias	Customer or User
Where-used/how- used	Input to the process of searching for vehicles. Output from the process of creating an account, updating profile, and making a purchase.
Content description	composed of entries (buyer)

Column Name	Description	Type	Length	Null able	Default Value	Key Type
B-Id	Unique auto generated number	Integer		Non-Nullable	1	PK
B-Name	Name of Buyer	Varchar	(50)	Nullable	None	
B-Email	Buyer Email	Varchar	(50)	Non-Nullable	None	
B-Password	Strong encrypted password	Varchar	(50)	Non-Nullable	None	
B-Phone	Buyer Phone Number	Varchar	(50)	Nullable	None	
B-Address	Home Location	Varchar	(50)	Nullable	None	

5.1.2.2   Seller

<table>
<tr><th colspan="2" align="center">Seller</th></tr>
<tr><td>Name</td><td>Seller</td></tr>
<tr><td>Alias</td><td>Vendor, Dealer</td></tr>
<tr><td>Where-used/how- used</td><td>Input to the process of listing a vehicle for sale.
Output from processes updating ads and deleting ads.</td></tr>
<tr><td>Content description</td><td>composed of entries (seller)</td></tr>
</table>

Column Name	Description	Type	Length	Nullable	Default Value	Key Type
S-Id	Unique auto generated number	Integer		Non-Nullable	1	PK
S-Name	Name of Seller	Varchar	(50)	Nullable	None	
S-Email	Seller Email	Varchar	(50)	Non-Nullable	None	
S-Password	Strong encrypted password	Varchar	(50)	Non-Nullable	None	
S-Phone	Seller Phone Number	Varchar	(50)	Nullable	None	
S-Address	Home Location	Varchar	(50)	Nullable	None	

5.1.2.3 Vehicles

Vehicles

Name	Vehicles
Alias	Cars, Automobiles
Where-used/how- used	Input to the process of listing a vehicle for sale. Output from processes involving vehicle searches and inquiries.
Content description	composed of entries (vehicles)

Column Name	Description	Type	Length	Null able	Default Value	Key Type
V-Id	Unique auto generated number	integer		Non-Nullable	1	PK
V-city	City in which vehicle is available for sale	Varchar	50	Non-Nullable		
Reg-year	Year of registration	Varchar	50	Non-Nullable		
Model-year	Year in which vehicle assembled	Varchar	50	Non-Nullable		
Reg-city	City in which vehicle is registered	Varchar	50	Non-Nullable		
Mileage	How many kilometers vehicle has covered in its lifetime	Varchar	50	Non-Nullable		
Make	Company name of vehicle (e.g. Toyota)	Varchar	50	Non-Nullable		
Model	Model name of vehicle (e.g. Corolla)	Varchar	50	Non-Nullable		
Variant	Variant of vehicle (e.g. Gli,Xli)	Varchar	50	Non-Nullable		
Colour	Color of vehicle	Varchar	50	Non-Nullable		
Body-Type	Vehicle design, shape and space (e.g. SUV,Sedan)	Varchar	50	Non-Nullable		
Engine-Capacity	The volume of fuel and air that can be pushed through a car's cylinders in cc	Varchar	50	Non-Nullable		
Transmission	Type of shifting gear	Varchar	50	Non-Nullable		

Price	*Asking price for the car by the seller*	*Float*		*Non-Nullable*		
Description	*Description of vehicle by the seller*	*Varchar*	*50*	*Nullable*		
Assembly	*Country in which vehicle is assembled*	*Varchar*	*50*	*Non-Nullable*		
Max-price	*Maximum price to sell the car set by the seller for negotiation chatbot*	*Float*		*Non-Nullable*		
Min-price	*Minimum price to sell the car set by the seller for negotiation chatbot*	*Float*		*Non-Nullable*		
Pictures	*Pictures of vehicles added by seller*	*Byte64 encoded string*	*64 Bytes*	*Non-Nullable*		

5.1.2.4   Admin

<table>
<tr><td colspan="2" align="center">Admin</td></tr>
<tr><td>Name</td><td>Admin</td></tr>
<tr><td>Alias</td><td>Administrator</td></tr>
<tr><td>Where-used/how- used</td><td>Manages user accounts, listings, and resolves disputes.
Input to processes involving user management and system configuration.
Output from processes generating reports and analytics.</td></tr>
<tr><td>Content description</td><td>composed of entries (admin)</td></tr>
</table>

Column Name	Description	Type	Length	Null able	Default Value	Key Type
Admin-Id	*Unique auto generated number*	*integer*		*Non-Nullable*	*1*	*PK*
Admin-username	*The username used for logging in*	*Varchar*	*50*	*Non-Nullable*		
Admin-password	*Strong encrypted password*	*Varchar*	*50*	*Non-Nullable*		
Full name	*The full name of the admin user.*	*Varchar*	*50*	*Non-Nullable*		
Contact	*The phone number associated with the admin user.*	*Varchar*	*50*	*Non-Nullable*		

5.1.2.5   Advertisement

<table>
<tr><td colspan="2" align="center"><h2>Advertisement</h2></td></tr>
<tr><td>Name</td><td>Advertisement</td></tr>
<tr><td>Alias</td><td>Ad, Listing</td></tr>
<tr><td>Where-used/how- used</td><td>Input to processes involving the creation and management of listings.
Output from processes displaying advertisements to potential buyers.</td></tr>
<tr><td>Content description</td><td>composed of entries (advertisement)</td></tr>
</table>

Column Name	Description	Type	Length	Null able	Default Value	Key Type
Ad-Id	Unique auto generated number	Integer		Non-Nullable	1	PK
V-Id	Id of vehicle to fetch details of vehicle for which the ad is posted	Integer		Non-Nullable		FK
S-Id	Id to fetch details of seller which fetch de	Integer		Non-Nullable		FK

5.1.2.6   Mechanic

Mechanic

Name	Mechanic
Alias	Auto Technician, Service Provider
Where-used/how- used	Input to processes involving the registration of mechanics and rating. Output from processes displaying mechanic information to buyers.
Content description	composed of entries (mechanics)

Column Name	Description	Type	Length	Null able	Default Value	Key Type
M-id	Unique auto generated number	integer		Non-Nullable	1	PK
M-Name	Name of mechanic	Varchar	50	Non-Nullable		
M-Address	Address of his work-shop	Varchar	50	Non-Nullable		
M-email	Email to login	Varchar	50	Non-Nullable		
Password	Strong Encrypted Password	Varchar	50	Non-Nullable		
M-phone	Mechanic Phone number	Varchar	50	Non-Nullable		
Avg-Rating	Average rating given by users	integer		Nullable		

5.1.3   Class Diagram
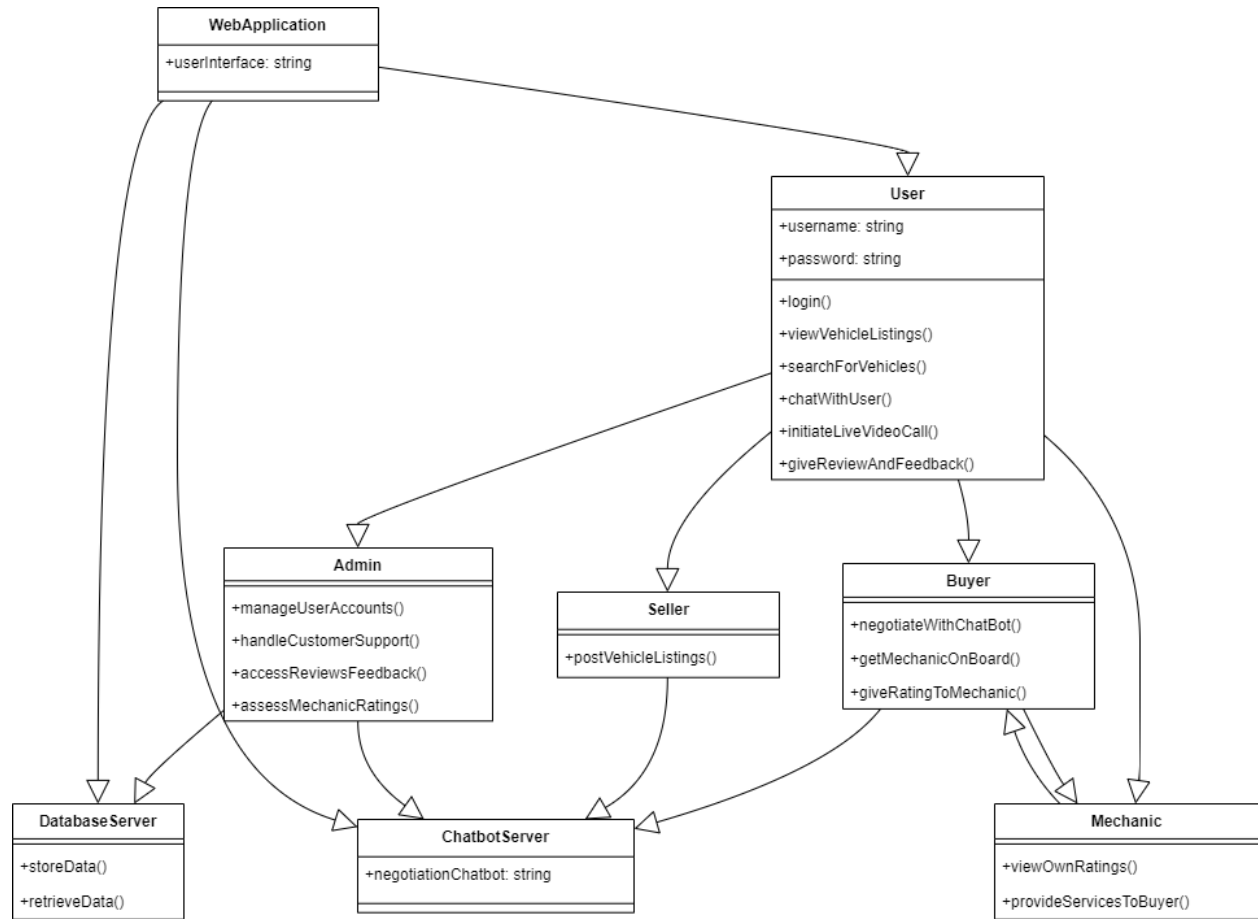
5.2 Application Design
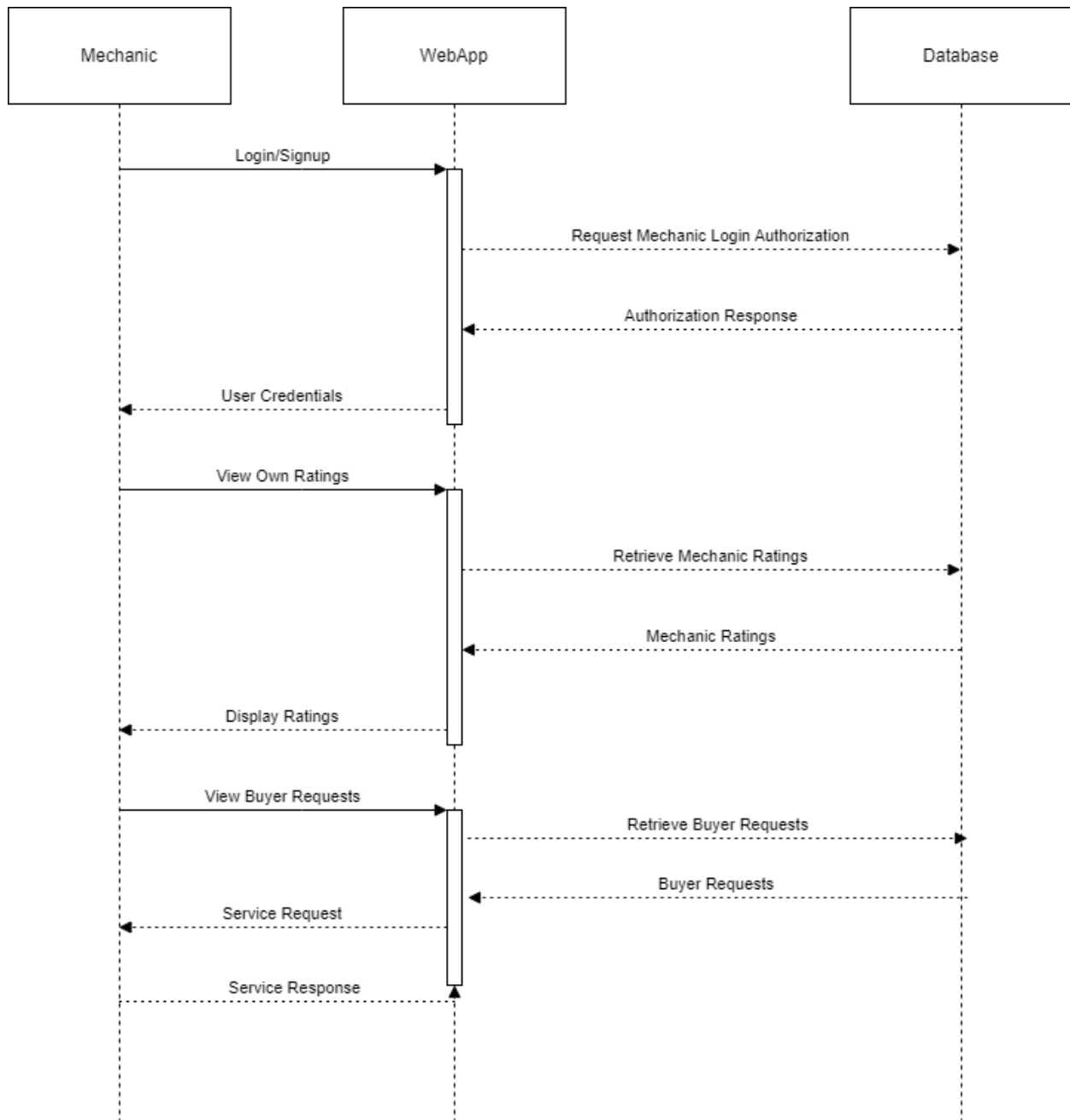
5.2.1 Sequence Diagram
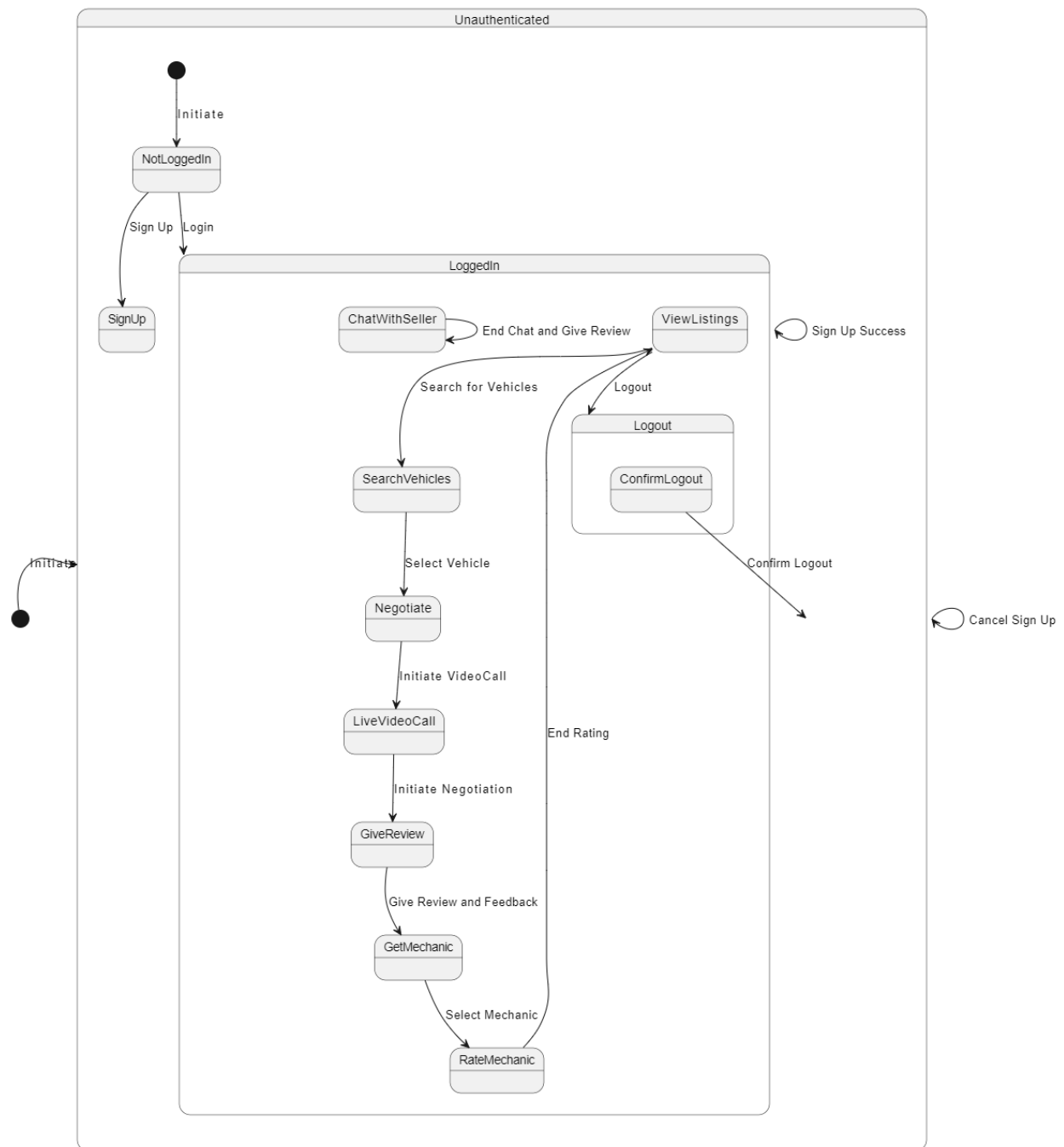
5.2.1.1 Buyer
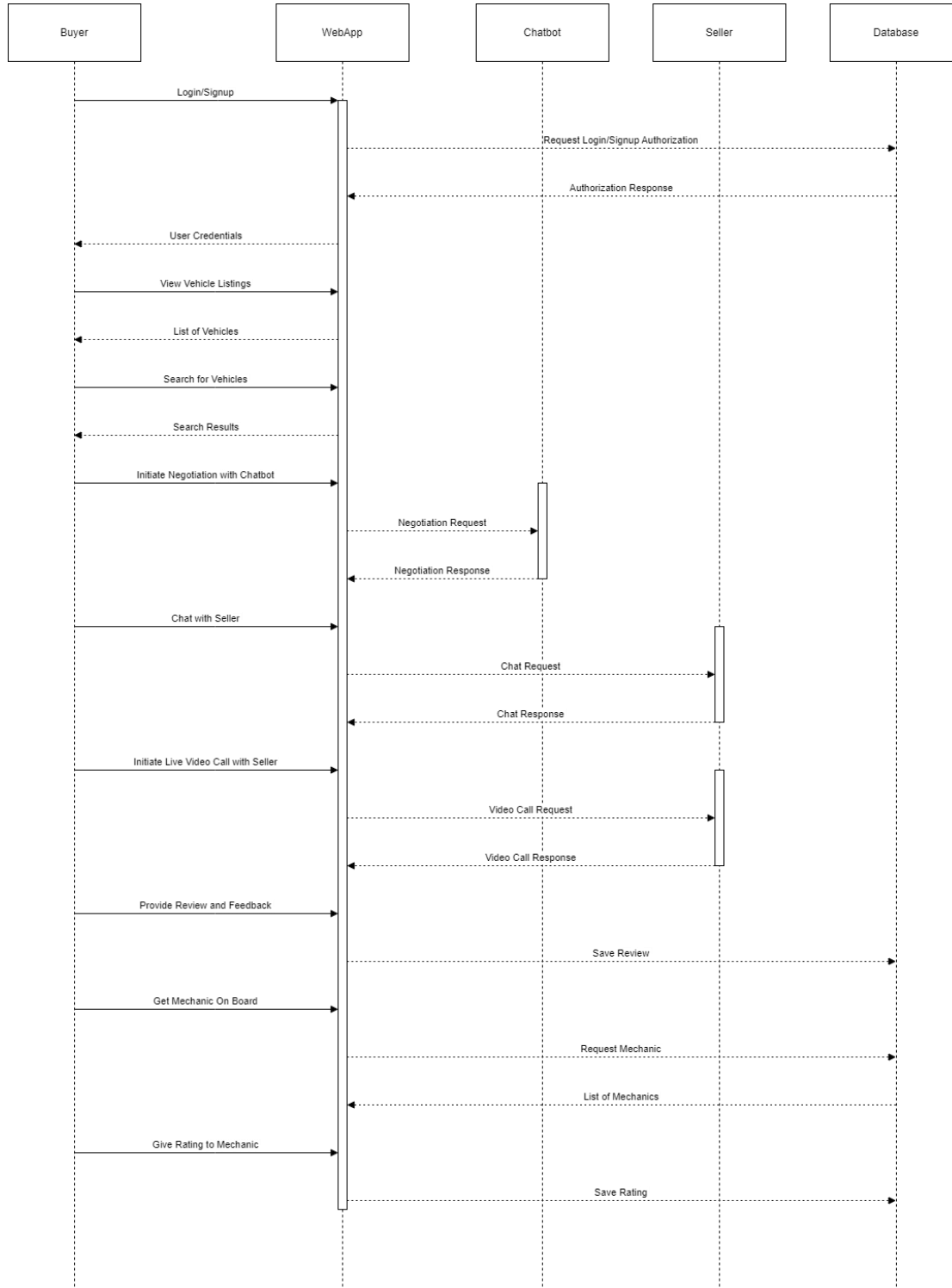
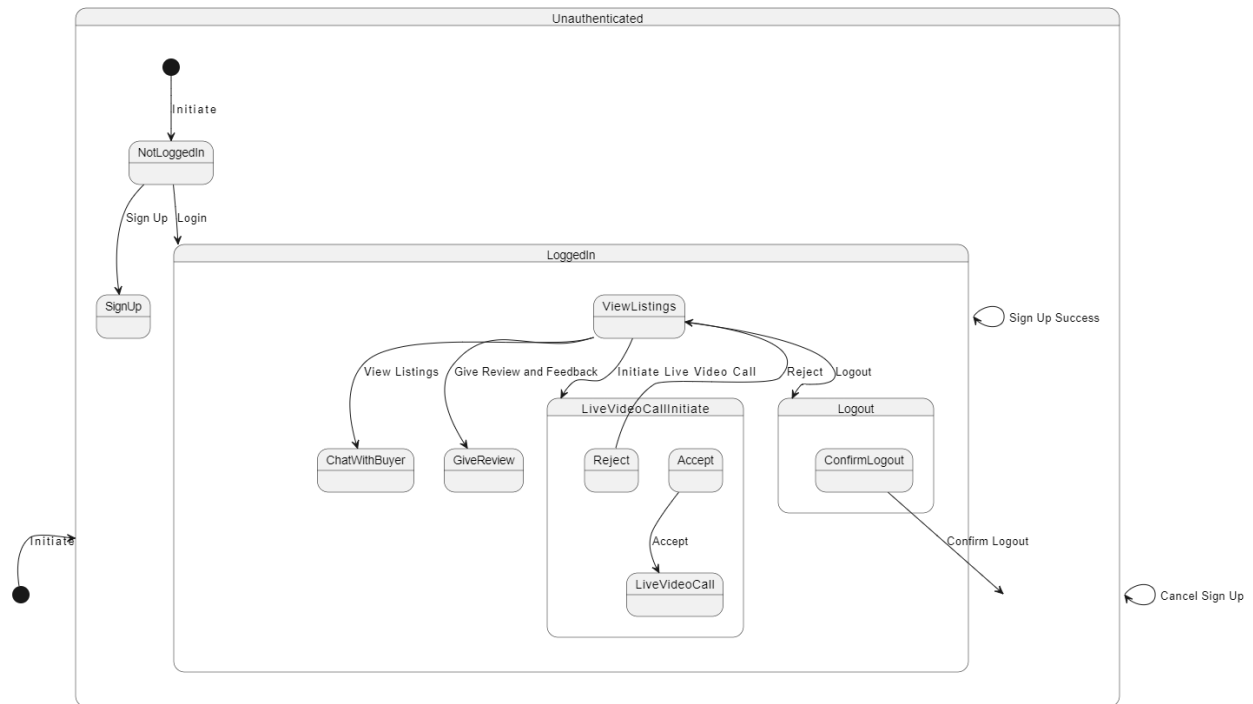## 5.2.1.2 Seller
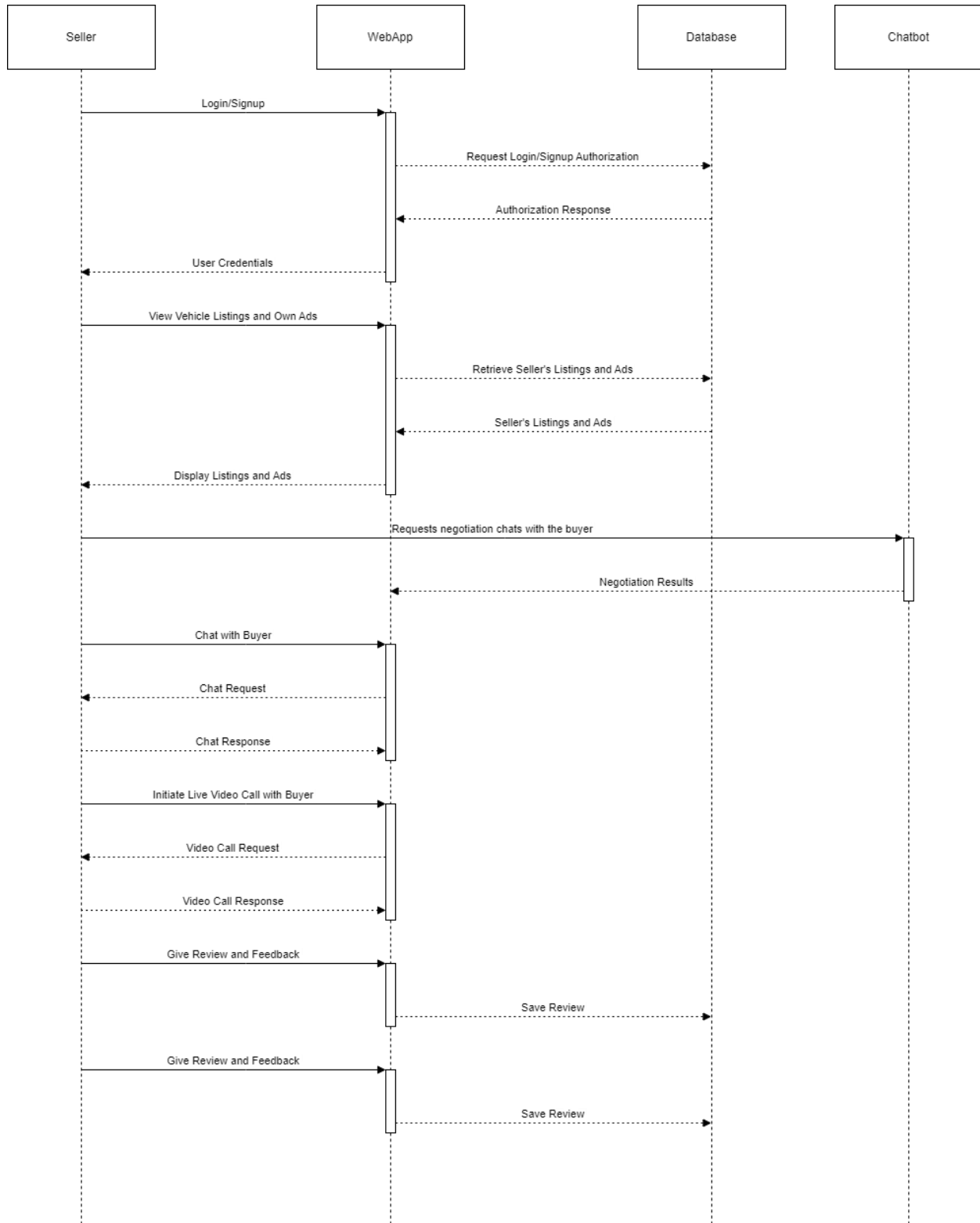
5.2.1.3 Admin
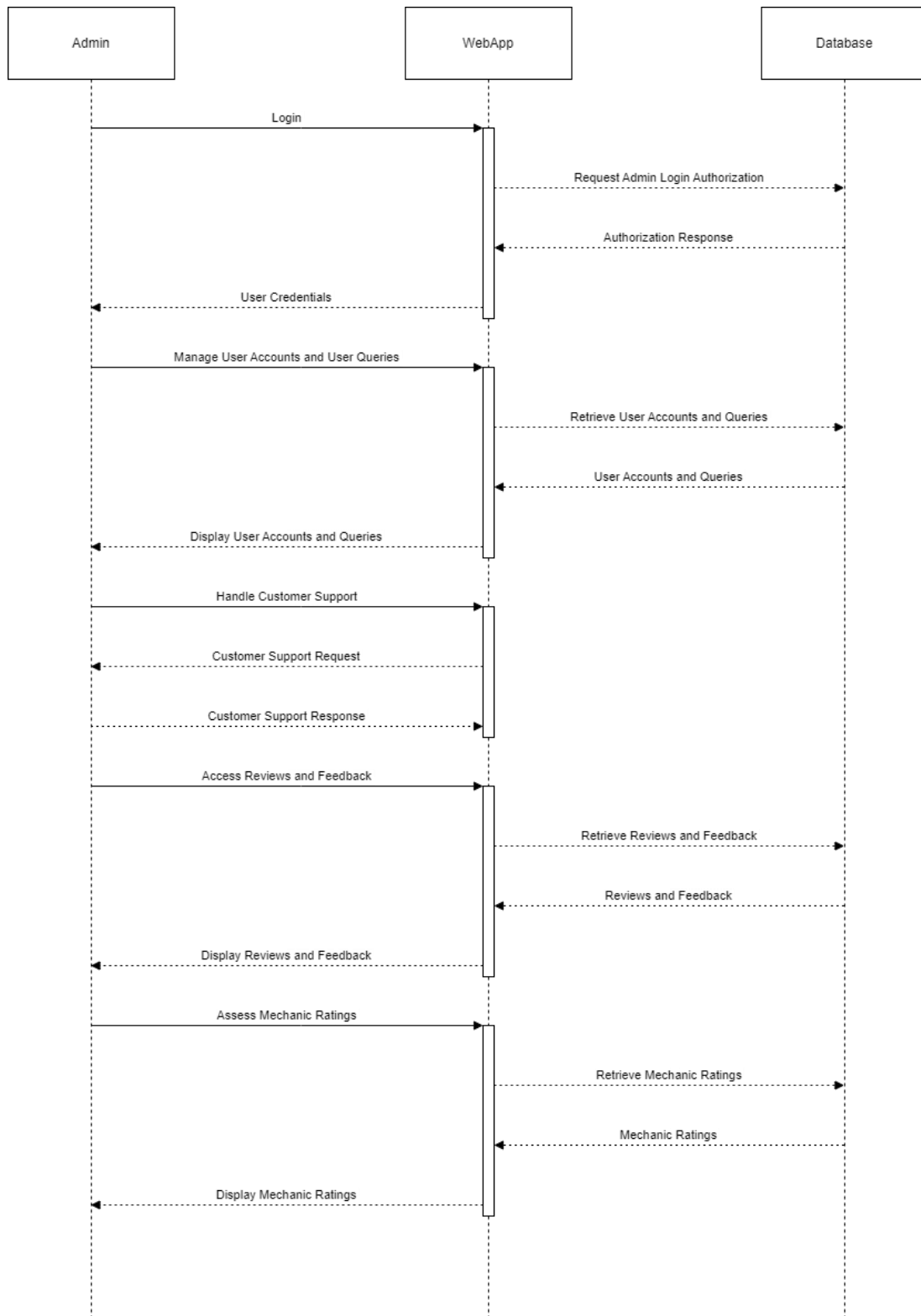
5.2.1.4　Mechanic

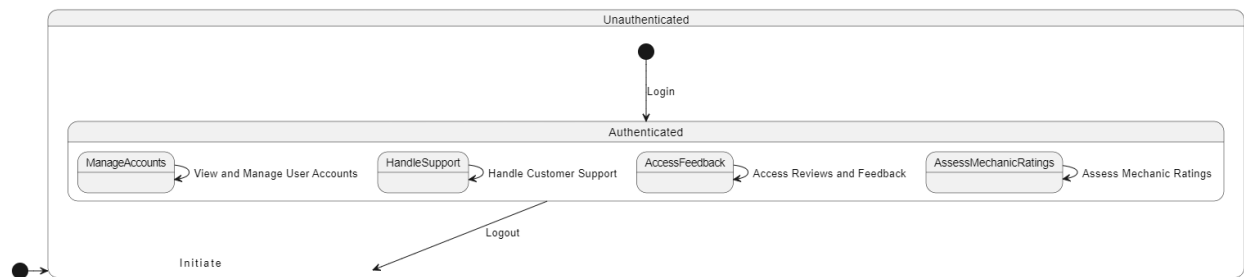## 5.2.2 State Diagram

5.2.2.1 Buyer

5.2.2.2   Seller

5.2.2.3   Admin

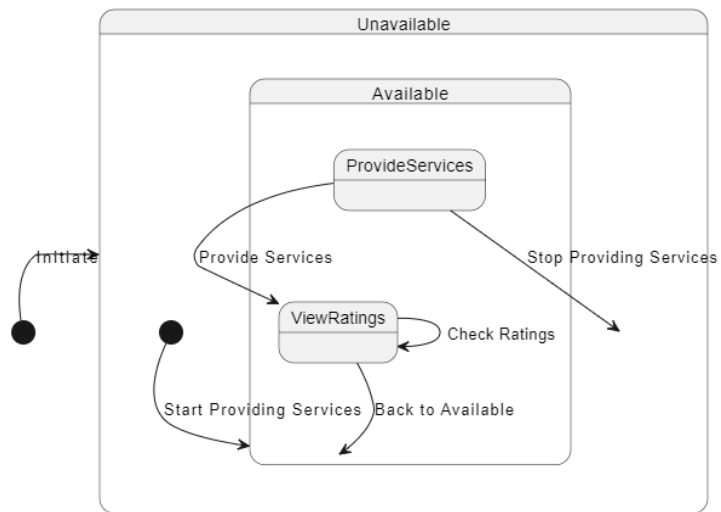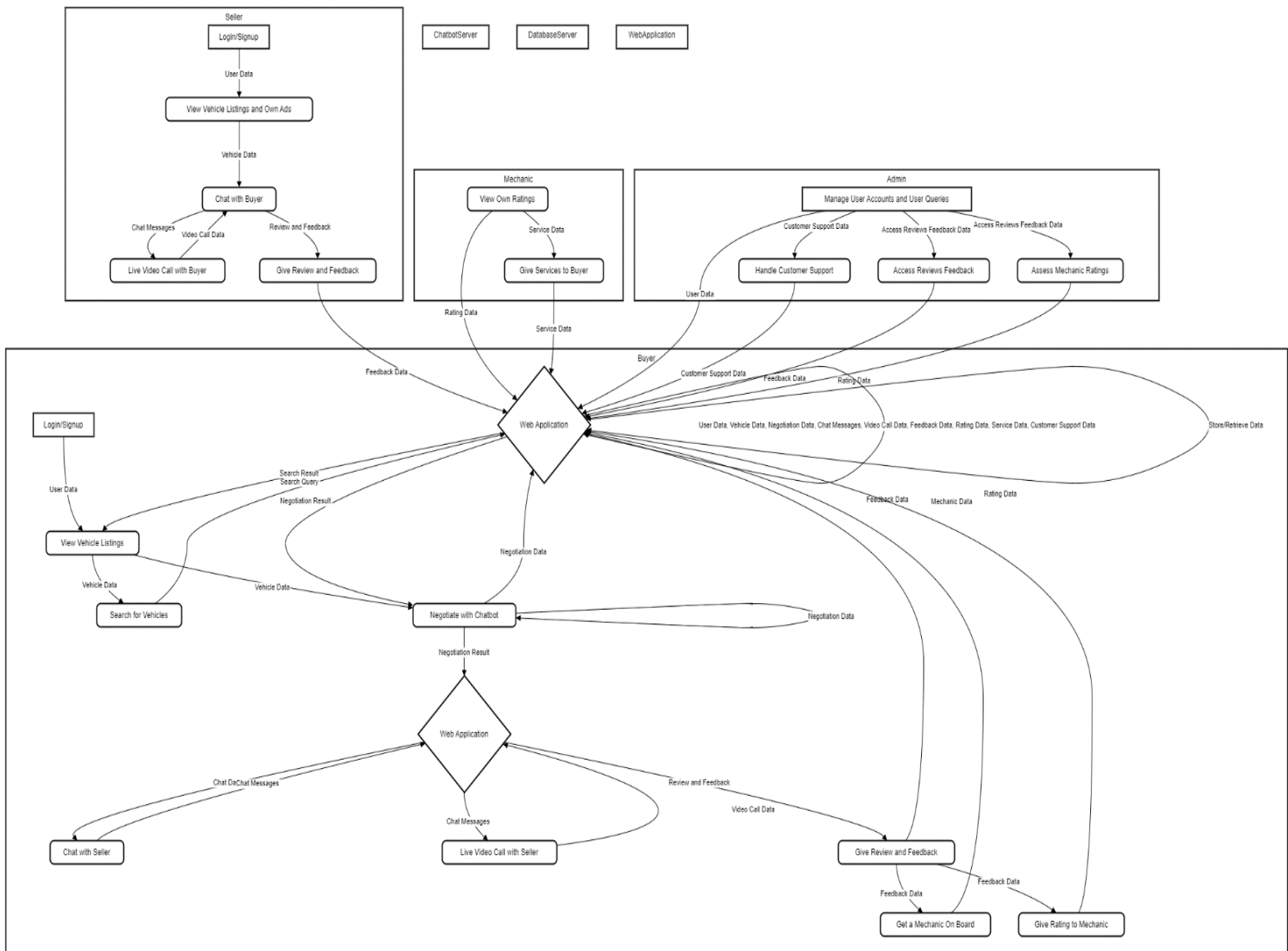## 5.2.2.4 Mechanic

5.2.3 Data Flow Diagram

6 References

Diagrams designed using
- Papyrus
- Draw.io
- Lucid chart