

# Vehicle Transport Management System (VTMS)

## Semester Project Proposal

A project submitted in partial fulfilment of the requirements for the completion of  
Software Engineering course



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# Contents

<b>1</b>	<b>Introduction</b>	<b>3</b>
1.1	Purpose . . . . .	3
1.1.1	Overview of the Document . . . . .	3
1.1.2	Purpose of the SRS . . . . .	3
1.1.3	Intended Audience . . . . .	3
1.2	Scope . . . . .	4
1.2.1	Product Identification . . . . .	4
1.2.2	Product Features . . . . .	4
1.2.3	Goals and Benefits . . . . .	5
1.3	Overview . . . . .	5
1.3.1	Document Structure . . . . .	5
1.4	Definitions, Acronyms, and Abbreviations . . . . .	5
1.5	References . . . . .	6
1.5.1	Standards . . . . .	6
1.5.2	Technical Documentation . . . . .	6
1.5.3	Development Tools . . . . .	6
<b>2</b>	<b>General Description</b>	<b>6</b>
2.1	Product Perspective . . . . .	6
2.1.1	Operational Constraints . . . . .	6
2.2	Product Functions . . . . .	7
2.3	User Characteristics . . . . .	7
2.3.1	Educational Level and Background . . . . .	7
2.3.2	Experience Levels . . . . .	8
2.4	Assumptions and Dependencies . . . . .	8
2.4.1	Technical Assumptions . . . . .	8
2.4.2	Operational Dependencies . . . . .	9
2.4.3	User Behavior Assumptions . . . . .	9
2.4.4	Future Enhancements . . . . .	10
2.5	Design and Implementation Constraints . . . . .	10
2.5.1	System Constraints . . . . .	10
<b>3</b>	<b>Specific Requirements</b>	<b>11</b>
3.1	Functional Requirements . . . . .	11
3.1.1	User Registration . . . . .	11
3.1.2	User Authentication . . . . .	11
3.1.3	Browse Vehicles . . . . .	12
3.1.4	Search Vehicles . . . . .	12
3.1.5	Manage Cart . . . . .	13
3.1.6	Advance Payment Processing . . . . .	13
3.1.7	Shipment Tracking . . . . .	13
3.1.8	Final Payment Processing . . . . .	14
3.1.9	Order Cancellation and Refund . . . . .	14
3.1.10	Notifications . . . . .	15
3.1.11	Administration and Reporting . . . . .	15
3.1.12	Vehicle Management . . . . .	16
3.1.13	Customer Feedback . . . . .	16

3.2	External Interface Requirements . . . . .	16
3.2.1	User Interface Design . . . . .	16
3.2.2	Hardware and Computing Environment . . . . .	17
3.2.3	Software Interfaces . . . . .	18
3.2.4	Communication Interfaces . . . . .	19
3.3	Performance Requirements . . . . .	19
3.4	Software System Attributes . . . . .	20
3.4.1	Security . . . . .	20
3.4.2	Reliability . . . . .	20
3.4.3	Maintainability . . . . .	21
3.5	Other Requirements . . . . .	21
3.5.1	Database Requirements . . . . .	21
3.5.2	Operational Requirements . . . . .	21
3.5.3	Site Adaptation Requirements . . . . .	21
<b>4</b>	<b>Appendices</b>	<b>22</b>
4.1	Appendix A: Context Diagram . . . . .	22
4.2	Appendix B: Usecase Diagram . . . . .	22

# 1 Introduction

Efficient vehicle transportation is very important in maintaining customer trust and ensuring a smooth and timely delivery of the vehicle. There are still many organizations who depend on traditional methods in transportation and shipment records and payments. The depend on this method often results in data loss, duplicate records, making transportation process late, billing errors, and also effects delivery tracking. To overcome this problem, this document provides the requirements for a Vehicle Transport Management System (VTMS). This system is designed to automate the vehicle purchasing, keeping the records of the vehicles and customers, track the shipment, and payment processing in order make an efficient process of transportation and improve the coordination among all the stockholders.

## 1.1 Purpose

### 1.1.1 Overview of the Document

This System Requirements Specification (SRS) document provides a detailed description of the VTMS functionalities, objectives, and requirements. The primary goal is to guide the development process and ensure alignment with the expectations of all stakeholders, including project sponsors, developers, and users.

### 1.1.2 Purpose of the SRS

The purpose of this document is to:

- **Define Requirements:** Outline the functional and non-functional requirements for VTMS.
- **Guide Development:** Serve as a reference for the development team to ensure the successful implementation of features.
- **Align Stakeholders:** Clarify VTMS objectives for all stakeholders, ensuring mutual understanding and alignment.

### 1.1.3 Intended Audience

The SRS is designed to address the needs of diverse stakeholders involved in the development and deployment of VTMS.

#### **Stakeholders:**

- **Transport Owners:** Ensure the system aligns with organizational objectives, such as operational efficiency, scalability, and customer satisfaction.
- **Project Managers:** Monitor development progress and ensure resource allocation aligns with project timelines and goals.

#### **Development Teams:**

- **Software Engineers:** Use detailed functional and non-functional requirements as a roadmap for implementation.

- **System Architects:** Design scalable and secure infrastructure based on the specified requirements.

**End-Users:**

- **Customers and Organizational Staff:** Ensure the system effectively supports vehicle booking, shipment tracking, billing, and management processes in a user-friendly and reliable manner.

## 1.2 Scope

### 1.2.1 Product Identification

Vehicle Transport Management System (VTMS) is a web-based computerized platform which is designed to manage and monitor vehicle transportation services efficiently. This system supports transport manager's administrators and customers by automating the vehicle purchase, billing, record management and shipment tracking.

### 1.2.2 Product Features

**VTMS Will Provide:**

- **User Services:** Enable users to register, browse available transport services, and place vehicle orders.
- **Shipment Tracking:** Provide shipment tracking, with location updates when shipments reach specific checkpoints.
- **Payment Management:** Allow users to make a 30% advance payment and complete the remaining payment after delivery.
- **Transport Manager Support:** Assist transport managers in selecting vehicles, updating shipment status, and managing deliveries.
- **Administrative Controls:** Allow administrators to manage users, vehicles, schedules, orders, and system records.
- **Notifications and Records:** Generate invoices, send payment notifications to customers, and maintain transportation records.

**VTMS Will Not Include (Initial Release):**

- Hardware-level GPS tracking devices.
- AI-driven advanced route optimization.
- A fully detailed user interface.
- A mobile application (initial release is web-based only).

### 1.2.3 Goals and Benefits

- **Reliability:** Reduces errors and confusion caused by manual record-keeping and billing processes.
- **Customer Satisfaction:** Enhances customer trust through accurate tracking and timely delivery updates.
- **Scalability:** Lays the foundation for future expansion and feature enhancements.

## 1.3 Overview

### 1.3.1 Document Structure

This SRS document is organized as follows:

1. **Introduction:** Describes the purpose, scope, and overview of the SRS.
2. **Overall Description:** Details user personas, system environment, assumptions, and constraints.
3. **Specific Requirements:** Provides in-depth functional and non-functional requirements.
4. **System Features:** Enumerates core features like user profiles, skill listings, messaging, and feedback.
5. **External Interface Requirements:** Explains interaction points such as APIs, user interface, and dependencies.
6. **Other Non-Functional Requirements:** Covers performance, scalability, security, and reliability aspects.
7. **Appendices and References:** Lists definitions, references, and additional resources.

## 1.4 Definitions, Acronyms, and Abbreviations

Term/Acronym	Definition
VTMS	Vehicle Transport Management System
SRS	System Requirements Specification.
UI/UX	User Interface/User Experience, defining how users interact with the platform.
GitHub	A platform for version control and collaborative software development.

## 1.5 References

These references ensure the technical accuracy and alignment of VTMS development with industry standards and best practices.

### 1.5.1 Standards

1. IEEE Std 830-1984: IEEE Recommended Practice for Software Requirements Specifications. IEEE, 1984.
2. IEEE Std 1002-1987: IEEE Standard Taxonomy for Software Engineering Standards.

### 1.5.2 Technical Documentation

1. University Software Engineering Project Guidelines.

### 1.5.3 Development Tools

1.  $\text{\LaTeX}$  for documentation
2. GitHub
3. Figma

## 2 General Description

This section provides a comprehensive overview of Vehicle Transport Management System (VTMS), its context within related systems, major functionalities, user characteristics, and the constraints under which it operates. Rather than specifying detailed requirements, this section sets the stage for understanding those requirements by offering relevant background and descriptive elements.

### 2.1 Product Perspective

Vehicle Transport Management System is a standalone web application that operates independently to manage vehicle transportation operations. This system is not replacement of an existing software but it's designed to automate the Transportation services like shipment record management, billing generation.

#### 2.1.1 Operational Constraints

VTMS operates within defined environmental and development is subject to the following constraints. 1. System Interfaces: The system uses standardized APIs for third-party services such as authentication, notifications (optional) and payment. 2. User Interfaces: VTMS offers an intuitive web-based interface optimized for accessibility. 3. Hardware Requirements: VTMS can operate on any internet-enabled device with a modern web browser. No specialized hardware is necessary.

## 2.2 Product Functions

The Vehicle Transport Management System (VTMS) is designed to support vehicle exchange operations through a set of integrated functional components. These components work together to perform vehicle purchase, tracking, billing, and record management.

1. **User Registration:** VTMS allows users to create accounts and log in using valid credentials. The system ensures that customers, transport managers, finance staff, and administrators have access only to their relevant features.
2. **Vehicle Browsing and Purchase:** Customers can browse available transportation options and view details such as vehicle types, prices, and availability. They can select a specific vehicle and submit a purchase request.
3. **Payment Processing:** The system supports advance and final payments. Customers pay 30% of the bill as an advance during purchase and the remaining amount after delivery. Payment details are recorded, and notifications and receipts are sent to the customer.
4. **Shipment Tracking:** Upon submission of a purchase request, VTMS generates a shipment record with a unique tracking ID. The system tracks the shipment from dispatch to final destination, ensuring smooth and accurate delivery.
5. **Notifications and Communications:** Automated notifications are sent to administrators, customers, and other relevant stakeholders regarding payment confirmation, shipment dispatch, delivery, and order cancellations.
6. **Reporting:** VTMS generates transport, shipment, and payment reports to help management and finance teams monitor operations and maintain accurate records.

## 2.3 User Characteristics

### 2.3.1 Educational Level and Background

VTMS is designed to support users with different educational backgrounds and varying levels of technical understanding:

- **Basic Users:** These include customers and staff with limited technical knowledge. The system provides simple and clear instructions to help them navigate the interface easily.
- **Intermediate Users:** Users with some technical background, such as transport staff, can access features like shipment tracking, status updates, and recording shipment details.
- **Advanced Users:** This group includes system administrators and technical staff with high technical proficiency. They manage user roles, identify and resolve system errors, and oversee all records related to vehicles and customers.



### 2.3.2 Experience Levels

The Vehicle Transport Management System (VTMS) is designed to support users with varying levels of experience in using computerized systems:

- **Beginner Users:** Users with little or no prior experience with transport management software. VTMS provides an intuitive interface, guided workflows, and clear instructions to help them perform basic tasks such as vehicle browsing, booking, payments, and shipment tracking with minimal training.
- **Intermediate Users:** Users with moderate experience, such as transport staff or frequent customers, who can efficiently manage routine operations. They handle shipment updates, vehicle assignments, payment verification, and customer coordination using standard system features.
- **Expert Users:** Experienced users, including system administrators and senior transport managers, with extensive system knowledge. They utilize advanced features such as system configuration, user management, report generation, data monitoring, and overall system supervision.

## 2.4 Assumptions and Dependencies

The development, operation, and success of VTMS are influenced by various assumptions and dependencies. These elements play a crucial role in ensuring that the VTMS operates efficiently user needs. VTMS design and functionality rely on the following technical assumptions:

### 2.4.1 Technical Assumptions

The design and functionality of the Vehicle Transport Management System (VTMS) rely on the following technical assumptions:

- **Stable Internet Connections:** VTMS assumes that users, including customers, transport managers, and administrators, have access to stable internet connections. While the system will be optimized for varying network conditions, real-time features such as shipment tracking, payment confirmation, and notifications may experience delays under poor connectivity.
- **Modern Web Browsers:** VTMS assumes that users will access the system through modern, supported web browsers such as Google Chrome, Mozilla Firefox, or Microsoft Edge. Using outdated or unsupported browsers may result in limited functionality, security vulnerabilities, or degraded user experience.
- **Secure Third-party Payment Gateway Integration:** VTMS assumes the availability and reliability of third-party payment gateways for processing advance and final payments. The accuracy, security, and availability of payment processing depend on these external services. Downtime or failure in the payment gateway may temporarily affect transaction processing.

- **Centralized Server and Database Availability:** The system assumes continuous availability of centralized servers and databases used to store user information, vehicle records, shipment data, and payment details. System performance and data accessibility depend on the stability and maintenance of the hosting infrastructure.
- **Real-Time Data Updates and Notifications:** VTMS assumes that real-time or near real-time data synchronization mechanisms will function reliably to update shipment status, delivery progress, and system notifications. Delays or failures in these mechanisms may impact timely information delivery to users.

#### 2.4.2 Operational Dependencies

Several operational dependencies may impact the functionality and overall performance of the Vehicle Transport Management System (VTMS):

- **Third-Party APIs:** VTMS relies on external services and APIs for essential operations, including payment processing, notification delivery (email or SMS), and potential map or location services for shipment tracking. The availability, reliability, and security of these services are critical for smooth system operation. Any changes, failures, or disruptions may affect transaction processing, communication with users, or shipment tracking features.
- **Compliance and Financial Services:** VTMS handles financial transactions, including advance and final payments, and relies on secure payment gateways and financial compliance mechanisms. The system must operate in accordance with applicable banking regulations and digital payment standards. Changes in payment service policies or regulatory requirements may require system updates to ensure continued compliance and uninterrupted service.

#### 2.4.3 User Behavior Assumptions

The Vehicle Transport Management System (VTMS) operates under the following assumptions regarding user behavior:

- **Accuracy and Integrity in Information Submission:** Users, including customers and organizational staff, are expected to provide accurate and truthful information during registration, vehicle booking, payment processing, and shipment updates. Correct entries are essential for reliable record keeping, shipment tracking, billing accuracy, and overall system effectiveness.
- **Responsible Use of Payment and Booking Features:** Users are assumed to responsibly use booking and payment functionalities, including making advance and final payments as defined and initiating cancellations only when necessary. Misuse of payment features or repeated incorrect transactions may affect system operations and financial reconciliation.
- **Engagement with System Notifications and Updates:** Users are expected to actively review system notifications related to payments, shipment

status, and delivery confirmations. Timely attention to these updates is important for smooth transportation workflows and effective coordination between customers and transport management staff.

- **Compliance with Organizational Policies:** Users are assumed to adhere to organizational rules, refund policies, and VTMS usage guidelines. Misuse, policy violations, or unauthorized activities may require administrative intervention and could impact service continuity.

#### 2.4.4 Future Enhancements

The Vehicle Transport Management System (VTMS) is designed with future expansion and continuous improvement in mind. The following provisions reflect potential enhancements planned for future versions of the system:

- **Mobile Applications:** Future versions of VTMS may include mobile applications for Android and iOS platforms. Mobile access will allow customers and transport staff to manage bookings, receive real-time shipment updates, track deliveries, and receive notifications conveniently while on the move.
- **Advanced Tracking and Analytics Features:** VTMS may integrate advanced data analytics and intelligent tracking features to improve transportation efficiency. Potential enhancements include route optimization, delivery time predictions, and performance analysis to support better operational decision-making.
- **Increased User Load and System Scalability:** The system anticipates growth in users, vehicles, and shipment records over time. Future development may focus on improving scalability, server performance, load balancing, and database optimization to ensure continued reliability and availability.

## 2.5 Design and Implementation Constraints

### 2.5.1 System Constraints

The design and implementation of the Vehicle Transport Management System (VTMS) are influenced by several constraints:

- **Initial Focus on Web-Only Implementation:** The first release of VTMS will be web-based only. Mobile applications and platform-specific clients are not included initially to ensure timely delivery and efficient use of available development resources. The web-based implementation provides sufficient functionality for managing vehicle bookings, payments, and shipment tracking.
- **Budget and Timeline Limitations:** VTMS development is constrained by a predefined budget and academic project timeline. Advanced features, such as AI-based route optimization, predictive analytics, and hardware-integrated tracking solutions, are deferred to future versions. The primary focus is on implementing core transportation management features reliably within the given timeframe.

- **Limited Team Size:** VTMS is being developed by a small project team, which may limit rapid feature expansion and large-scale scalability in the initial phase. The development effort will prioritize code quality, system reliability, and maintaina

## 3 Specific Requirements

### 3.1 Functional Requirements

The functional requirements define the core features of the Vehicle Transport Management System (VTMS).

#### 3.1.1 User Registration

**Introduction:** The system shall provide a user registration feature that allows new users to create accounts by submitting valid personal information.

**Inputs:**

- User Name
- Email Address
- Contact Number
- Password

**Processing:**

- Validate user input for correctness and required format.
- Check for duplicate accounts to ensure unique registration.
- Encrypt the password for secure storage.
- Store user data in the database.

**Outputs:**

- Registration success confirmation message.
- Error message if validation fails.

#### 3.1.2 User Authentication

**Introduction:** The system shall authenticate users to provide secure access based on assigned roles.

**Inputs:**

- Email or Username
- Password

**Processing:**

- Verify credentials against stored records.
- Grant access according to user roles if credentials are valid.

**Outputs:**

- Successful login message.
- Access denied message if authentication fails.

### 3.1.3 Browse Vehicles

**Introduction:** The system shall allow users to browse all available vehicles without applying any filters.

**Inputs:**

- None (optional: category selection)

**Processing:**

- Retrieve all vehicle records from the database for display.

**Outputs:**

- List of all available vehicles.
- Vehicle detail view for selected vehicles.

### 3.1.4 Search Vehicles

**Introduction:** The system shall allow users to search for vehicles using specific filters to narrow down results, improving usability and helping users find relevant vehicles quickly.

**Inputs:**

- Vehicle type
- Price range
- Brand
- Optional filters (e.g., model year, fuel type)

**Processing:**

- Query the database for vehicle records that match the specified search criteria.
- Sort or prioritize results as needed to improve relevance.

**Outputs:**

- Filtered list of available vehicles.
- Detailed view for each selected vehicle.

### 3.1.5 Manage Cart

**Introduction:** The system shall allow customers to manage selected vehicles before purchase, enabling them to add or remove items and review the total cost.

**Inputs:**

- Selected vehicles
- Add/remove requests

**Processing:**

- Update the cart based on user actions.
- Recalculate the total cost of selected vehicles.

**Outputs:**

- Updated cart summary.
- Purchase confirmation (if user proceeds to checkout).

### 3.1.6 Advance Payment Processing

**Introduction:** The system shall process a 30% advance payment to confirm vehicle transportation.

**Inputs:**

- Payment details
- Purchase ID

**Processing:**

- Calculate the 30% advance amount based on the total purchase.
- Process the payment through a secure gateway.
- Update the payment status in the system.

**Outputs:**

- Payment confirmation receipt.
- Notification sent to finance and transport management staff.

### 3.1.7 Shipment Tracking

**Introduction:** The system shall create shipment records and generate a unique tracking ID to monitor the shipment throughout its transit.

**Inputs:**

- Booking confirmation
- Shipment status updates

**Processing:**

- Send shipment details to transport management.
- Assign a unique tracking ID to the shipment.
- Update the shipment location at each transit stage.

**Outputs:**

- Tracking ID for the shipment.
- Updated shipment status.

**3.1.8 Final Payment Processing**

**Introduction:** The system shall allow customers to complete the final payment and confirm successful delivery.

**Inputs:**

- Remaining payment amount
- Delivery confirmation

**Processing:**

- Verify the final payment.
- Send confirmation notifications to finance and transport management.
- Update the delivery status in the system.

**Outputs:**

- Final payment receipt.
- Confirmed delivery status.

**3.1.9 Order Cancellation and Refund**

**Introduction:** The system shall support order cancellation by customers and apply a refund policy that deducts a fixed percentage of the advance payment when an order is cancelled.

**Inputs:**

- Order ID
- Cancellation request from customer
- Advance payment amount

**Processing:**

- Verify the order status upon receiving a cancellation request.
- If the order is cancelled after the advance payment, deduct 50% of the advance amount as a cancellation charge.

- Calculate the refundable balance and update the system records.

**Outputs:**

- Refund confirmation showing the deducted amount.
- Updated payment and order status.
- Notification sent to the customer and finance department.

### **3.1.10 Notifications**

**Introduction:** The system shall provide notifications to users and staff regarding status updates, payments, and shipment tracking.

**Inputs:**

- Event triggers (e.g., payment success, shipment dispatched, shipment delivered)
- User contact details

**Processing:**

- Generate notifications based on triggered events.
- Send notifications to users and staff via email or SMS.

**Outputs:**

- Notification messages delivered to users and staff.

### **3.1.11 Administration and Reporting**

**Introduction:** The system shall allow administrators to manage users, maintain system data, and generate reports.

**Inputs:**

- User management actions (e.g., add, update, delete users)
- Report generation requests

**Processing:**

- Update system records based on administrator actions.
- Enforce access control and permissions.
- Compile and generate requested transport and management reports.

**Outputs:**

- Updated system records.
- Generated transport and management reports.



### 3.1.12 Vehicle Management

**Introduction:** Administrators shall be able to manage vehicle records, including adding, updating, or deleting vehicles.

**Inputs:**

- Vehicle details (type, brand, price, availability)
- Action type (add, update, delete)

**Processing:**

- Validate input data for correctness and completeness.
- Update the vehicle inventory based on the specified action.

**Outputs:**

- Confirmation of the action taken.
- Updated vehicle inventory list.

### 3.1.13 Customer Feedback

**Introduction:** The system shall allow customers to provide feedback and rate the transport service.

**Inputs:**

- Feedback text
- Rating (1–5 stars)

**Processing:**

- Validate the feedback and rating inputs.
- Store feedback in the database for future reference.

**Outputs:**

- Confirmation message to the customer.
- Updated feedback database available for administrative review.

## 3.2 External Interface Requirements

### 3.2.1 User Interface Design

The Vehicle Transport Management System (VTMS) shall provide a simple, intuitive, and user-friendly web-based interface to support all system users, including customers, transport managers, and administrators. The interface is designed to ensure ease of use, reduce user errors, and support efficient interaction with system functionalities.

**Design Visuals:** This includes the following artifacts:

- Detailed wireframes and mock-ups for various pages of the website, including home pages, product detail pages, and checkout pages, showing layout, placement of elements, and visual design.
- Interactive prototypes or mock-ups demonstrating user interactions and transitions between pages.

#### **Interface Requirements:**

- **Web-Based Interface:** VTMS shall be accessible through standard web browsers without requiring additional software installation. Supported browsers include Google Chrome, Mozilla Firefox, and Microsoft Edge.
- **Role-Based Interface Views:** Different layouts and functionalities shall be presented based on user roles. Customers, transport managers, and administrators will each have access to role-specific dashboards and controls relevant to their responsibilities.
- **Responsive Interface:** The interface shall be responsive, supporting multiple devices and screen sizes (desktop dashboards, mobile booking, and finance modules) for flexibility, scalability, and ease of maintenance.
- **Consistency and Navigation:** The interface shall maintain consistent layout, color schemes, and navigation controls across all pages. Clear menus, buttons, and labels shall help users easily locate system features.
- **Forms and Input Validation:** Structured input forms shall be provided for registration, booking, payments, and shipment updates. Inputs shall be validated, and clear error messages shall guide users in correcting invalid entries.
- **Filtering Options:** Clear filtering options shall be provided to help users quickly find their desired vehicles, enhancing the customer experience.
- **Shipment Tracking Display:** The interface shall include a dedicated view for shipment status and progress, providing real-time or near real-time updates in a clear format.
- **Notification and Feedback Messages:** Notifications related to booking confirmation, payment status, shipment updates, delivery confirmation, and refund processing shall be displayed clearly and concisely.
- **Accessibility and Usability:** The interface shall support users with minimal technical experience, using readable fonts, adequate contrast, and responsive layouts to improve accessibility and usability.

### **3.2.2 Hardware and Computing Environment**

The Vehicle Transport Management System (VTMS) is designed to operate efficiently across commonly available hardware devices and computing environments.

#### **Mobile Devices (Future Support):**

1. VTMS may support mobile devices such as Android and iOS smartphones in future versions, allowing users to access booking, payment, and shipment tracking features on the go.

2. A responsive interface design will ensure compatibility with various screen sizes and resolutions.

#### **Desktop and Laptop Systems:**

1. The VTMS web application is optimized for desktop and laptop systems using modern web browsers such as Google Chrome, Mozilla Firefox, and Microsoft Edge.
2. The system supports standard multitasking workflows, allowing users to access multiple system pages or browser tabs simultaneously.

#### **Peripheral Devices:**

1. VTMS supports standard input and output devices, including keyboards, mice, and display screens, required for system operation.
2. Printer support is included for generating invoices, transport reports, and administrative records.

### **3.2.3 Software Interfaces**

The Vehicle Transport Management System (VTMS) interacts with multiple software components and external systems to ensure smooth and reliable operation.

#### **Authentication and Session Management:**

1. VTMS provides secure user authentication using username/email and password-based login mechanisms.
2. Session management ensures that authenticated users remain logged in during active sessions while preventing unauthorized access and session misuse.

#### **Database Management Systems:**

1. Structured system data, including user information, vehicle records, shipment details, and payment transactions, is stored in a centralized relational database.
2. The database system ensures data consistency, integrity, and secure access for all system operations.

#### **Payment Gateway Integration:**

1. VTMS integrates with third-party payment gateway software to securely process advance and final payments.
2. The system relies on these software interfaces for transaction authorization, confirmation, and payment status updates.

#### **Notification Services:**

1. VTMS interfaces with email and SMS services to deliver notifications related to booking confirmations, payment status, shipment updates, delivery confirmations, and refunds.
2. These services ensure timely communication between the system and its users.

#### **Mapping and Tracking Services (Future Support):**

1. Future versions of VTMS may integrate with third-party mapping or tracking software to enhance shipment location visualization and route monitoring.
2. These integrations will support improved tracking accuracy and delivery insights.

#### **3.2.4 Communication Interfaces**

VTMS ensures smooth and reliable communication between control centers and user applications.

##### **Network Protocols:**

1. Data is transmitted using HTTPS, ensuring secure communication between vehicles, servers, and client applications.

##### **Error Recovery:**

1. VTMS logs communication errors and performs automatic retries for failed data transmissions to reduce system downtime.
2. A detailed error reporting system allows operators to report connectivity or synchronization issues directly to technical support.

### **3.3 Performance Requirements**

The Vehicle Transport Management System (VTMS) shall meet the following performance criteria:

##### **System Response Time:**

- User actions (e.g., login, search vehicles, update shipment status) shall be completed within 2–3 seconds under normal load.
- Payment processing and confirmation shall complete within 5 seconds.

##### **Concurrent Users:**

- VTMS shall support at least 500 concurrent users performing different actions (customers, administrators, finance staff, and transport staff).
- The system shall be scalable to handle increased user loads in the future without performance degradation.

##### **Database Performance:**

- Database queries for vehicle browsing, shipment tracking, and payment history shall return results within 2 seconds for up to 10,000 records.

#### **Transaction Throughput:**

- The system shall process at least 50 vehicle booking transactions per minute without errors.
- Payment transactions must maintain 100% reliability with real-time confirmation.

#### **Availability and Uptime:**

- VTMS shall maintain 99.5% uptime, ensuring continuous availability for customers and staff.
- Maintenance operations should not affect live users or should be scheduled during low-traffic periods.

#### **Error Handling:**

- In case of system failure (server crash, network issue), VTMS shall gracefully recover without data loss.
- Users shall receive informative error messages within 1–2 seconds.

### **3.4 Software System Attributes**

#### **3.4.1 Security**

The Vehicle Transport Management System (VTMS) shall implement the following security measures:

- **Password Protection:** All user passwords shall be encrypted to ensure secure storage and prevent unauthorized access.
- **Role-Based Access Control:** Access to system features and data shall be controlled based on user roles, ensuring that customers, transport staff, finance staff, and administrators only access relevant functionalities.

#### **3.4.2 Reliability**

The Vehicle Transport Management System (VTMS) shall ensure system reliability through the following measures:

- **Data Protection:** The system shall prevent data loss under normal operation and in the event of system failures.
- **Regular Backups:** Regular backups of all critical data shall be maintained to enable recovery in case of unexpected failures.

### 3.4.3 Maintainability

The Vehicle Transport Management System (VTMS) shall be designed to support easy maintenance and updates:

- **Modular Design:** The system shall be modular, allowing individual components to be updated or replaced without affecting other parts of the system.
- **Ease of Updates:** The system architecture shall facilitate straightforward implementation of new features, bug fixes, and improvements.

## 3.5 Other Requirements

### 3.5.1 Database Requirements

The Vehicle Transport Management System (VTMS) shall use a centralized database to ensure efficient and reliable data management:

- **Centralized Database:** A single, centralized database shall store all system data, including user information, vehicle records, shipment details, and payment transactions.
- **Data Integrity:** The database shall enforce data integrity constraints to prevent corruption and ensure consistency across all records.

### 3.5.2 Operational Requirements

The Vehicle Transport Management System (VTMS) shall operate under the following conditions:

- **Internet Connectivity:** Stable internet connectivity shall be required for all users to access system functionalities, including vehicle booking, payment processing, and shipment tracking.

### 3.5.3 Site Adaptation Requirements

The Vehicle Transport Management System (VTMS) shall support flexible deployment options:

- **Deployment Options:** The system shall support both cloud-based deployment and local (on-premises) installation to accommodate different organizational needs.

## 4 Appendices

### 4.1 Appendix A: Context Diagram

**Description:** The context diagram illustrates the high-level interactions between the Vehicle Transport Management System (VTMS) and external entities, including customers, transport staff, administrators, and payment gateways (finance manager).

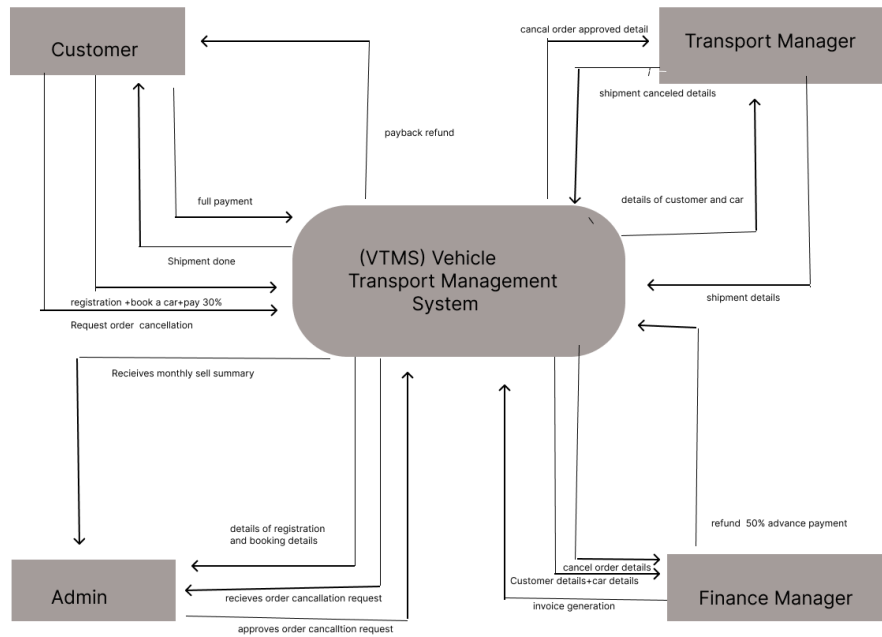


Figure 1: High-level context diagram of VTMS

### 4.2 Appendix B: Usecase Diagram

**Description:** The use case diagram represents the functional interactions between system users and the Vehicle Transport Management System (VTMS). It highlights major system functionalities from the user perspective.

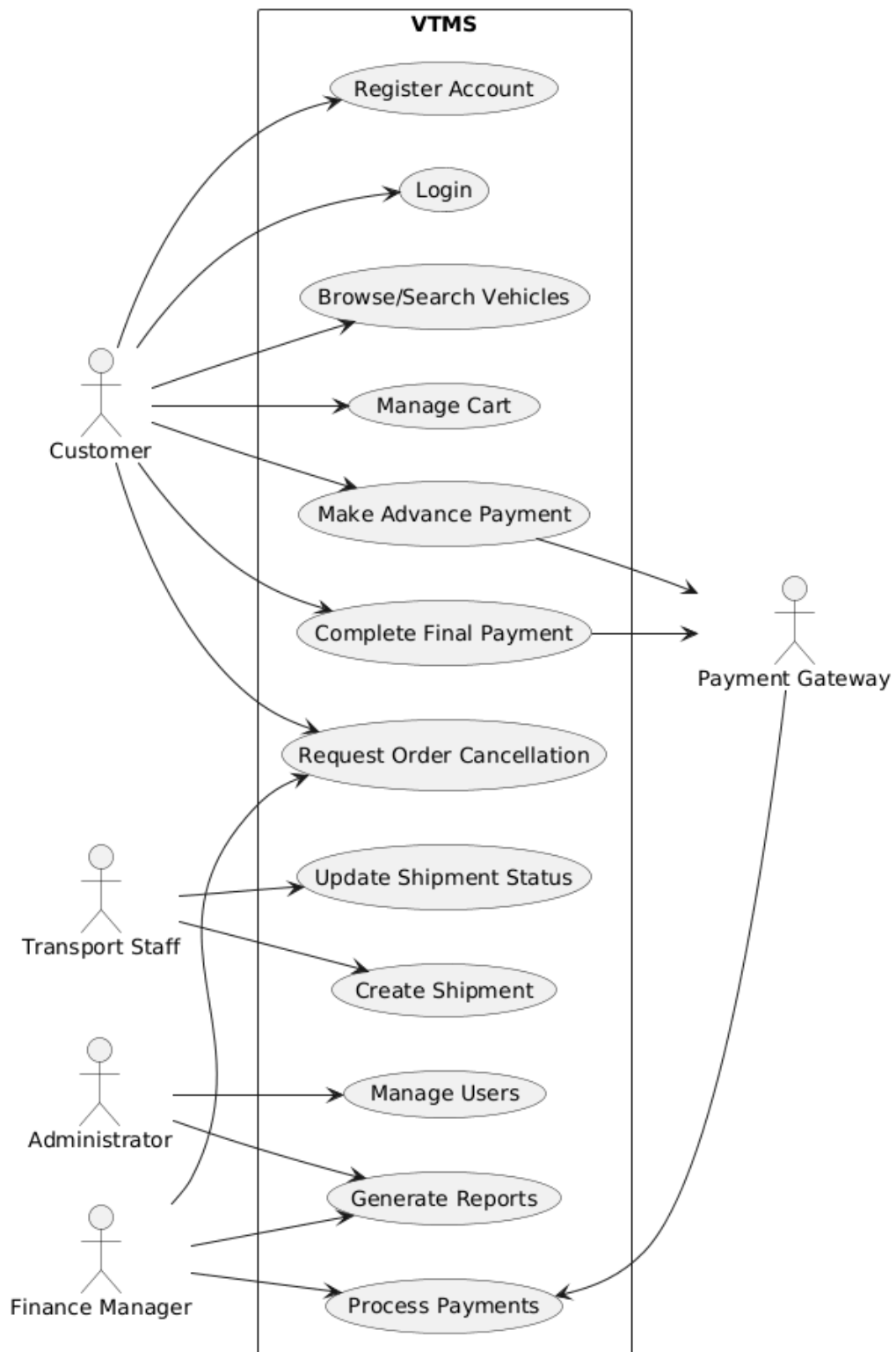


Figure 2: Use Case Diagram of VTMS