



Project Milestone 3

Vehicle Transport Management System (VTMS)

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1 Introduction

The Vehicle Transport Management System (VTMS) Milestone 3 Design Report documents the complete system architecture derived from the IEEE 830-1998 compliant Software Requirements Specification (SRS FR1–FR13). The report translates functional requirements into UML design artifacts including Use Case, multi-level Data Flow Diagrams, Sequence Diagrams, Activity Diagrams, Class Diagram, and Component Diagram. An interactive Figma prototype demonstrates the direct order workflow (Terms → Vehicle Details → 30% Advance Payment → Tracking ID) for four system actors.

2 Design Assumptions and Constraints

2.1 Design Assumptions

- Payment gateways are reliable and PCI-DSS compliant
- Transport managers update shipment status in a timely manner
- Vehicle buyers accept system terms before paying 30% advance
- Notification services are reliable
- A fixed 50% pre-shipment refund policy is acceptable
- All users have valid email addresses
- System is accessed via modern web browsers
- No vehicle inventory management is required

2.2 Design Constraints

2.2.1 Technical Constraints

- Web-based system using RESTful architecture
- Relational database MySQL
- Third-party payment integration required

2.2.2 Performance Constraints

- Page load time within 3 seconds (95th percentile)
- Payment processing within 10 seconds
- System capacity for 100 concurrent users

2.2.3 Security and Regulatory Constraints

- HTTPS and Role-Based Access Control required
- PCI-DSS compliance for all payment operations
- GDPR compliance for user data
- Compliance with international vehicle export regulations

3 Key Design Decisions

3.1 Direct Order Workflow

Decision: Linear workflow without inventory browsing

Justification: Reduces system complexity and aligns with export-based business model

3.2 Centralized Order Entity

Decision: Single Order entity managing all related operations

Justification: Ensures data consistency, traceability, and simplified state management

3.3 Event-Driven Notifications

Decision: Automatic notifications triggered on order status changes

Justification: Enables real-time communication and reduces manual coordination

3.4 Fixed Refund Policy

Decision: Automatic 50% refund before shipment

Justification: Simplifies financial workflows and enforces business rules

3.5 Role-Based Dashboards

Decision: Four actor-specific dashboards post-login

Justification: Information hiding, task-focused interface, enhanced usability

3.6 3-Level DFD Decomposition

Decision: Context \rightarrow Level 1 (6 processes) \rightarrow Level 2 (Order Processing detail)

Justification: Systematic decomposition ensures traceability to all SRS functional requirements

4 System Design Diagrams

4.1 Use Case Diagram

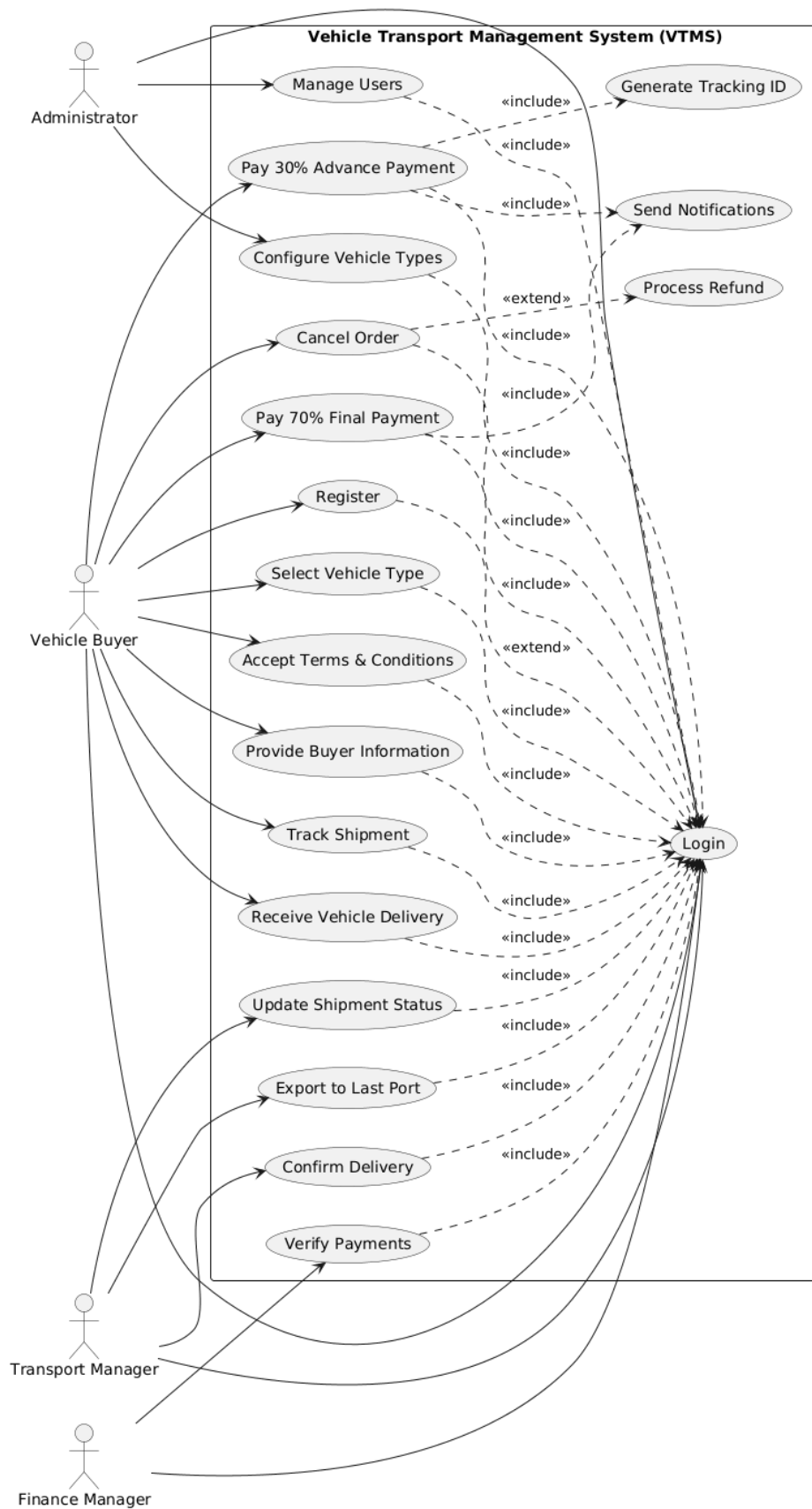


Figure 1: Use Case Diagram

4.2 Data Flow Diagrams

4.2.1 Context Diagram

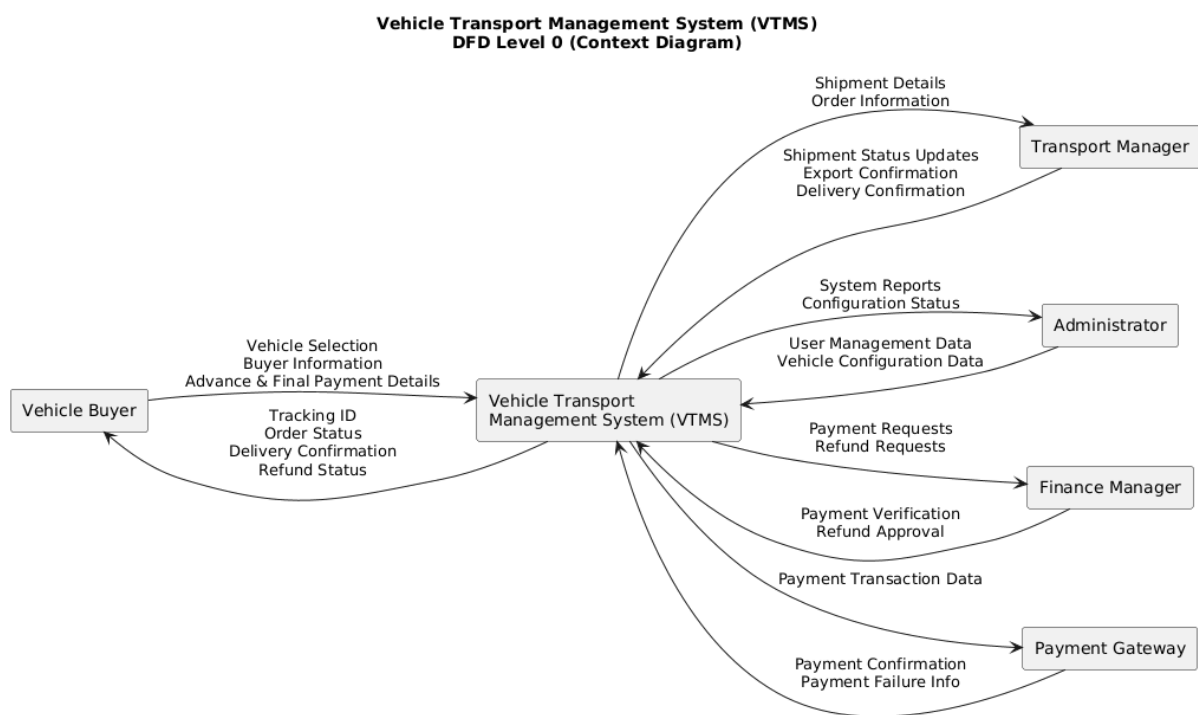


Figure 2: Context Diagram

4.2.2 Level 1 DFD

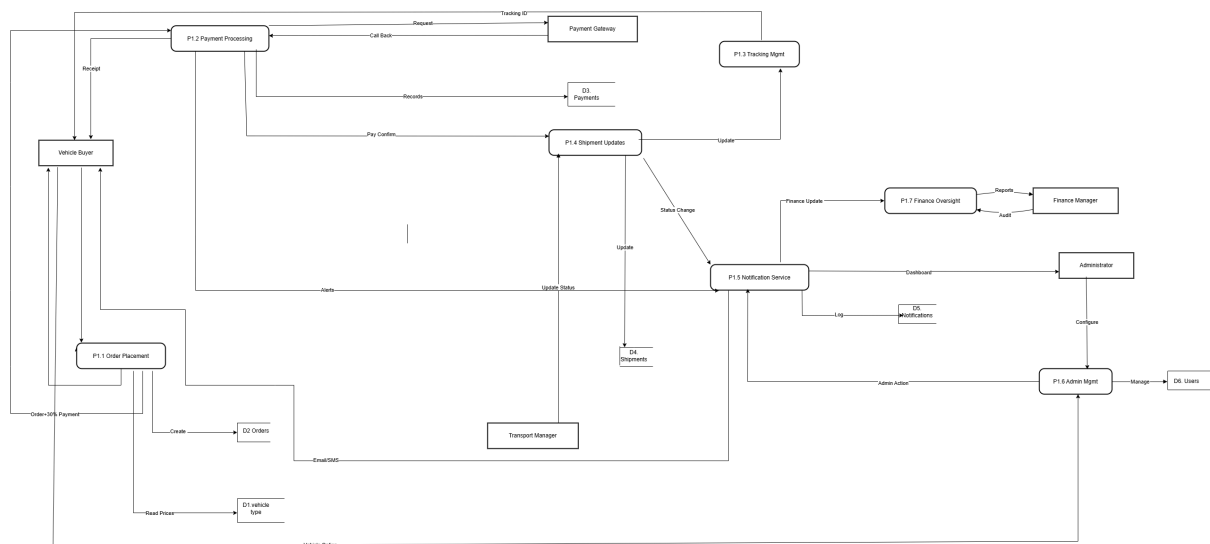


Figure 3: Level 1 Data Flow Diagram

4.2.3 Level 2 DFD

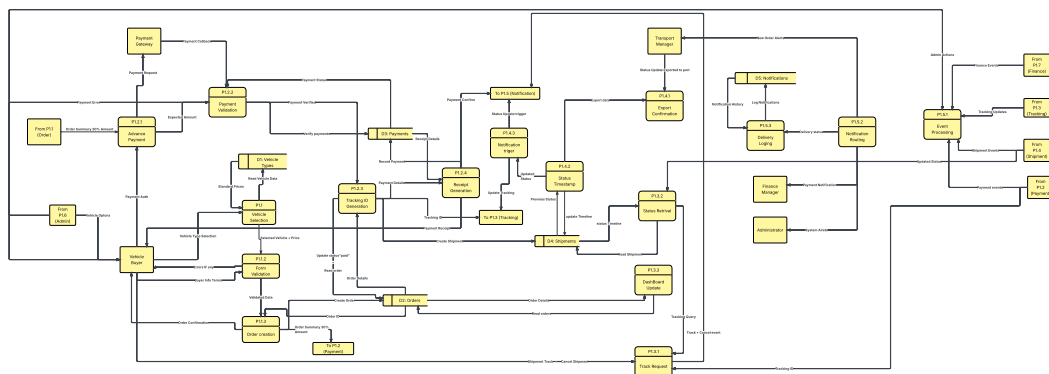


Figure 4: Level 2 Data Flow Diagram

4.3 Sequence Diagram

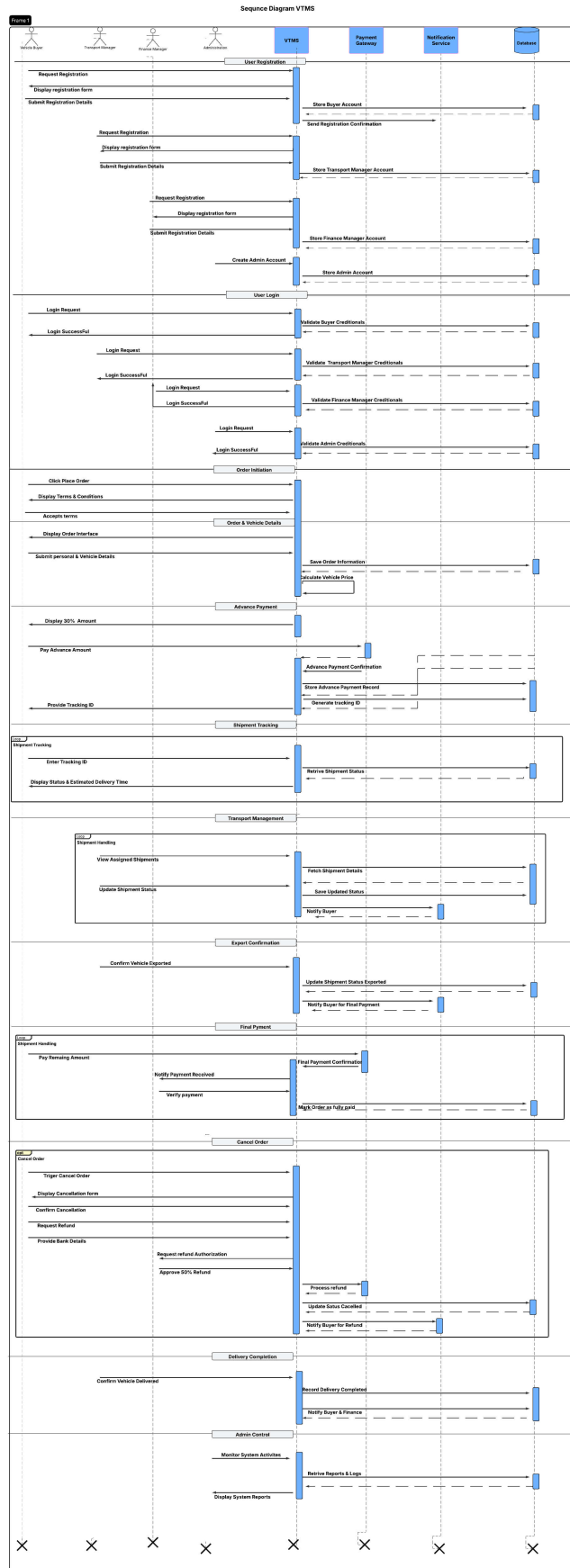


Figure 5: Sequence Diagram for Order Processing

4.4 Activity Diagrams

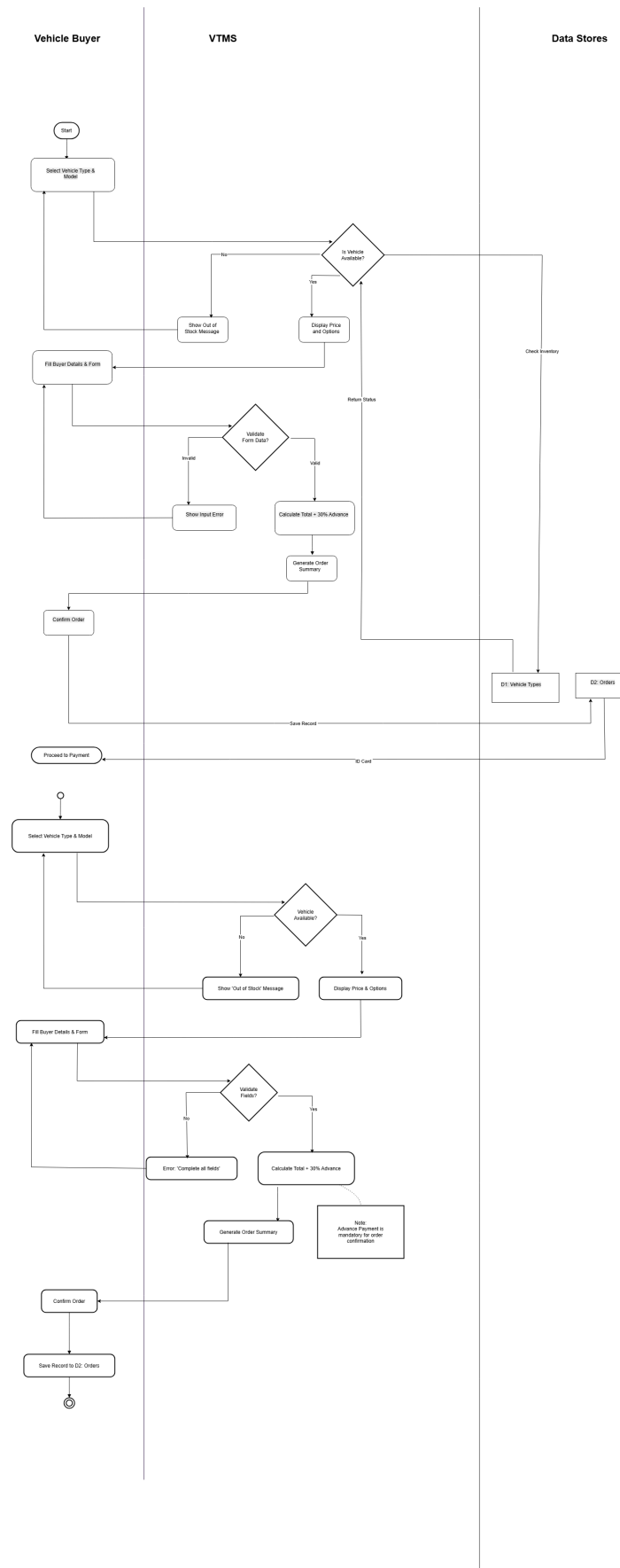


Figure 6: Order Workflow Activity Diagram

VTMS-Order initiation & Payment Process

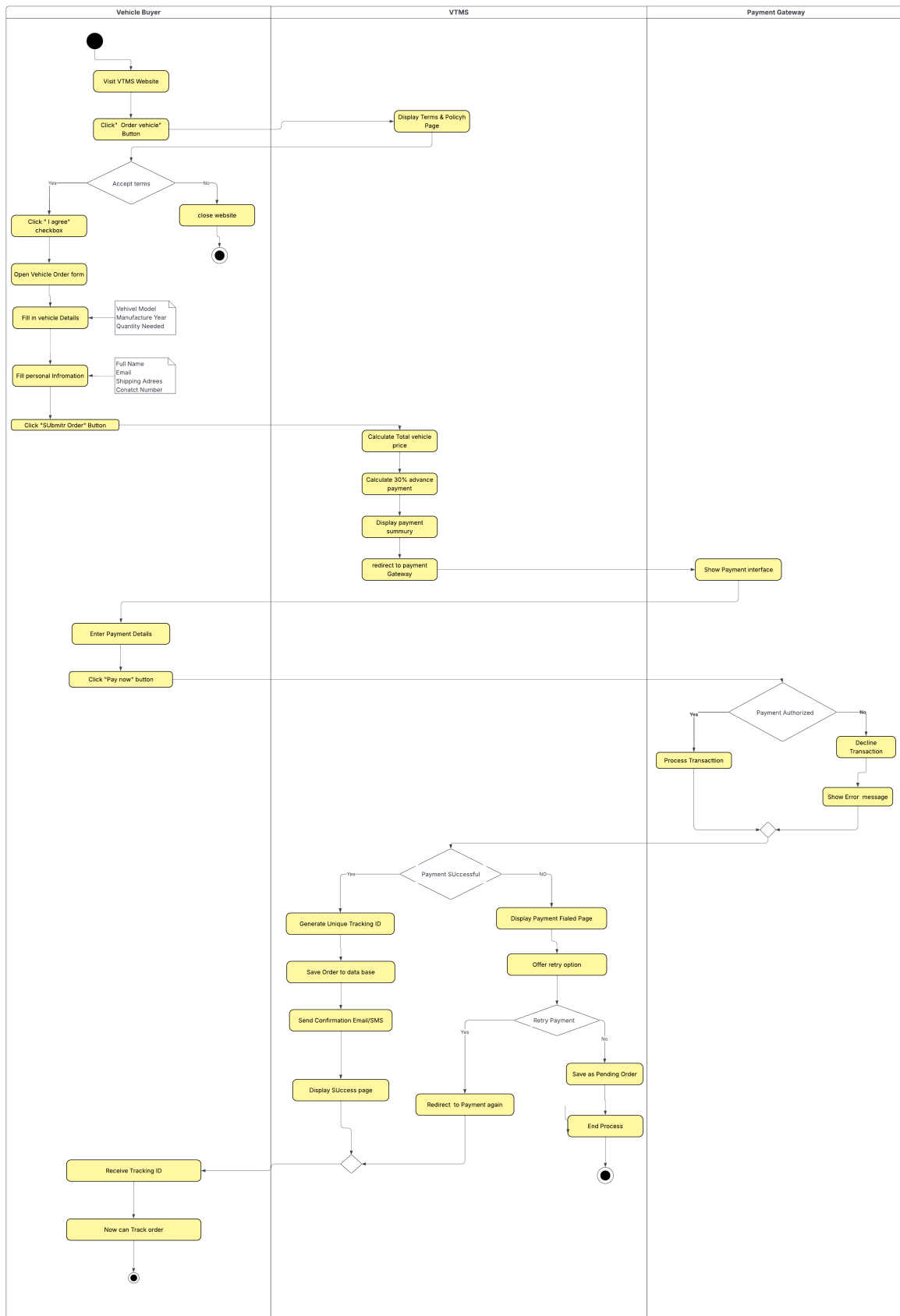


Figure 7: Payment Workflow Activity Diagram

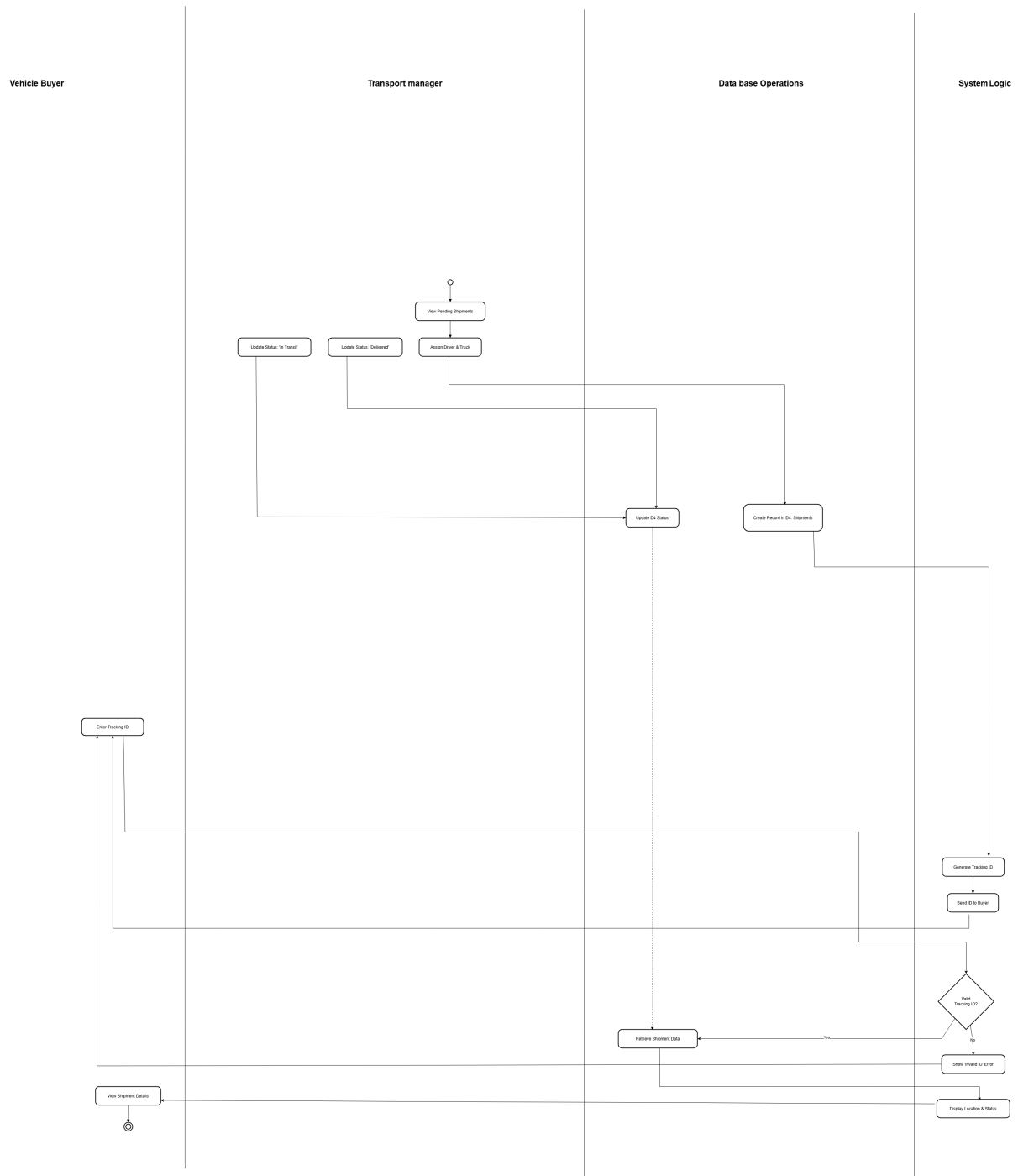


Figure 8: Shipment and Tracking Activity Diagram

VTMS-Order Cancellation Process

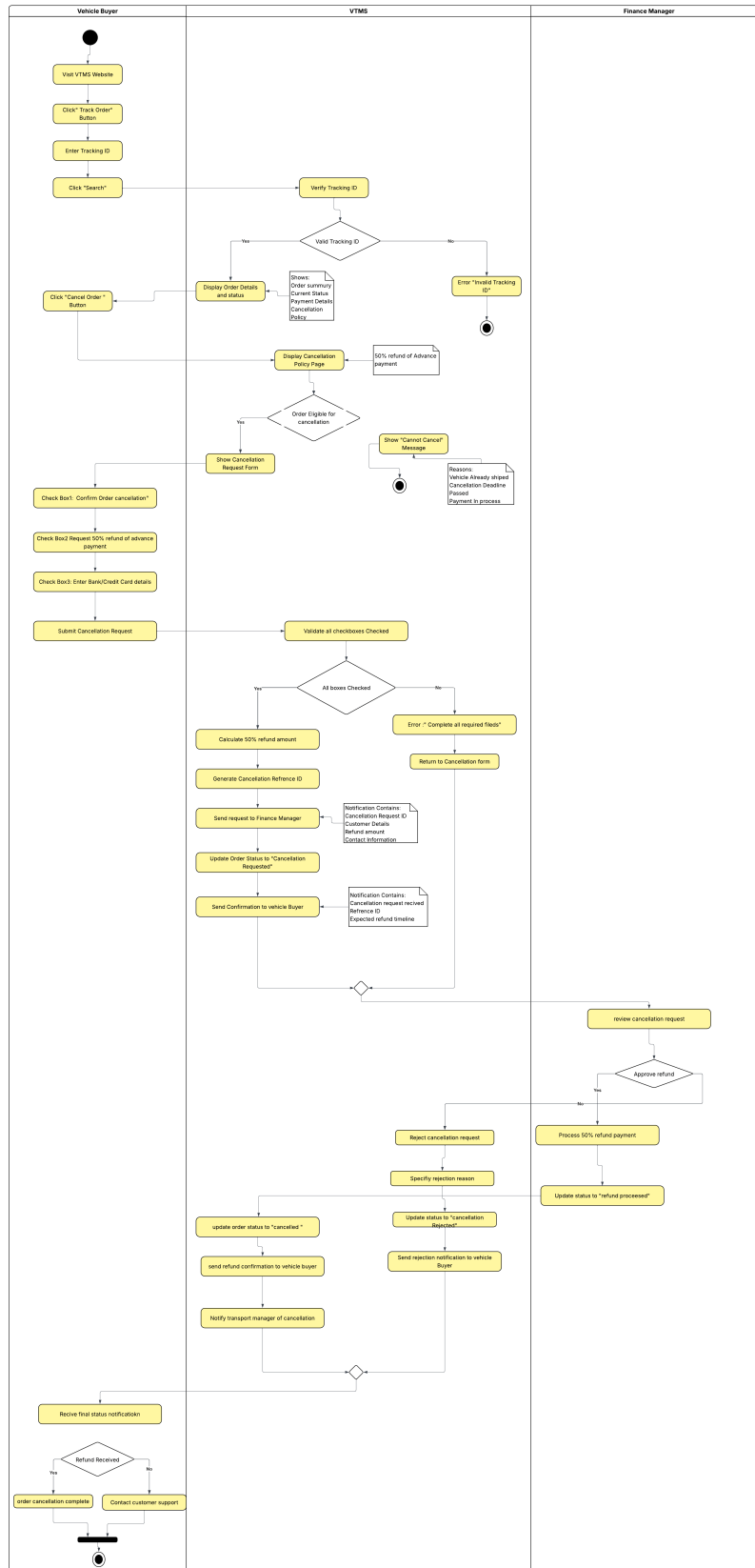


Figure 9: Order Cancellation Activity Diagram

4.5 Class Diagram

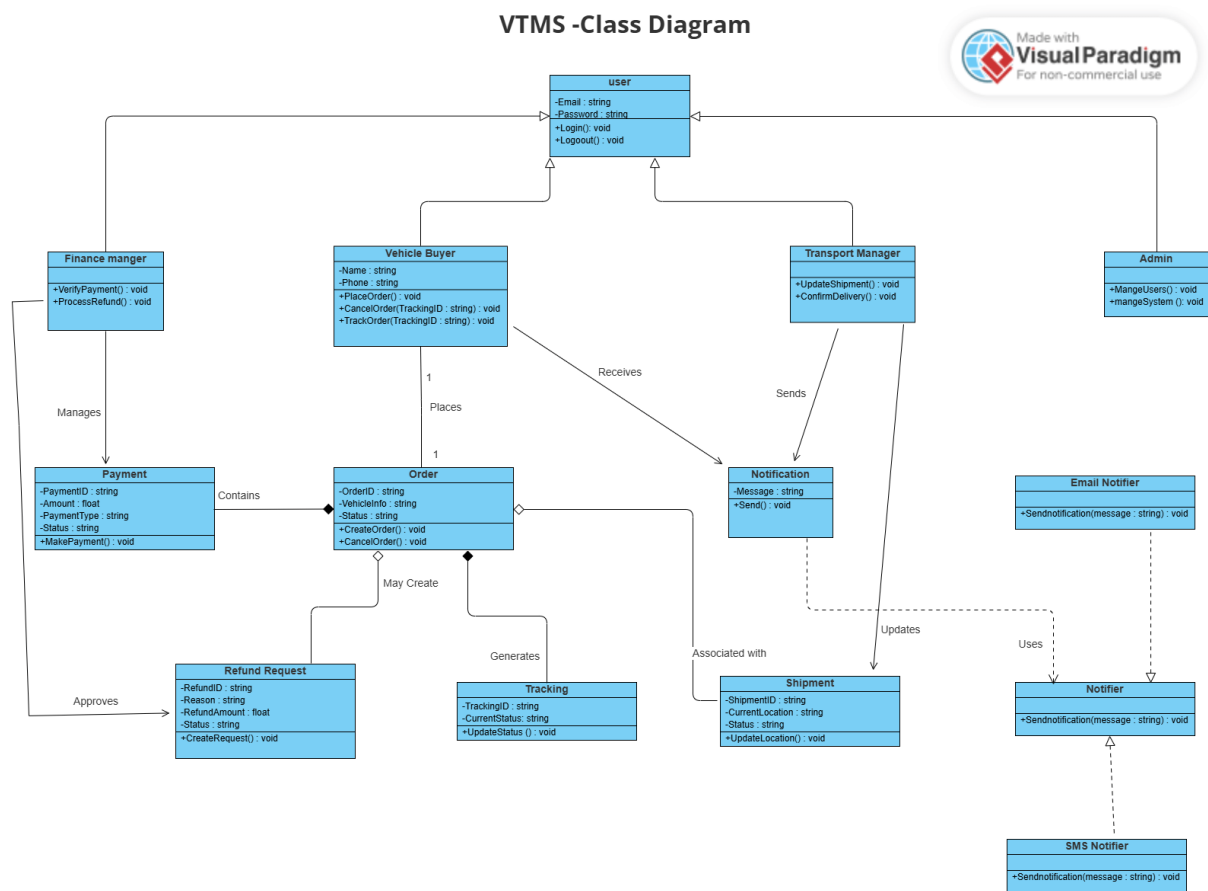


Figure 10: Class Diagram

4.6 Component Diagram

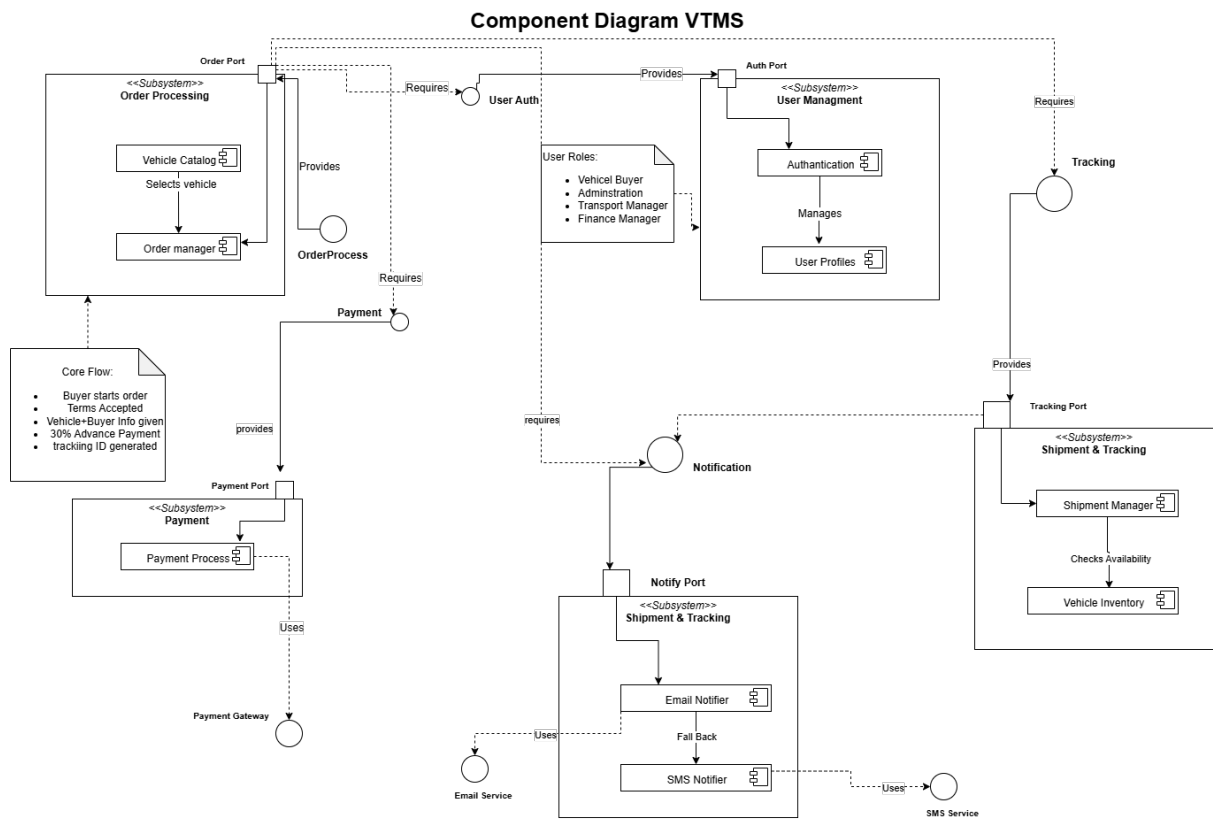


Figure 11: Component Diagram

5 VTMS Requirements-Design Traceability Matrix (No DFD0)

SRS ID	Requirement	Use Case	Activity	Sequence	Class	DFD Level	Component
FR0	User Registration/Login	UC0	-	SD1	UserAccount	-	Web Frontend
FR1	Order Initiation	UC1	AD1	SD1	Order	DFD1	Web Frontend
FR2	Terms Agreement	UC1	AD1	SD1	Order	DFD1	Web Frontend
FR3	Vehicle + 30% Calc	UC1	AD1	SD1	Order, Payment	DFD1	Web Frontend
FR4	Advance Payment	UC1	AD1	SD1	Payment	DFD2	Payment Gateway
FR5	Tracking ID	UC1	AD1	SD1	Tracking	DFD1	Database
FR6	Cancel Order	UC5	AD4	SD3	Refund	DFD3	Web Frontend
FR7	50% Refund	UC5	AD4	SD3	Refund	DFD2	Payment Gateway
FR8	Shipment Update	UC3	AD3	SD2	Shipment	DFD1	Database
FR9	Auto-Notify	UC3	AD3	SD2	Notification	-	Email Service
FR10	Delivery Confirm	UC4	-	SD4	Shipment	DFD1	Database
FR11	Final Payment	UC2	-	SD4	Payment	DFD2	Payment Gateway
FR12	Transport Dashboard	UC3	AD3	SD2	TransportManager	DFD1	Web Frontend
FR13	Admin Control	UC7	-	-	Administrator	-	Web Frontend

6 External Links

- GitHub Repository: https://github.com/MominaUmar74/Vehicle_Transport_Management_System
- Figma Prototype: <https://www.figma.com/community/file/1594775358558253744/vehicle-transport-management-system>
- Component Diagram: <https://drive.google.com/file/d/1w3I8YHM07Xnd2BCQXHnyN53a0aGOV/view?usp=sharing>
- Sequence Diagram: https://lucid.app/lucidchart/314ba7ca-dbd0-4e8d-9c1d-8ef03fcb97a/edit?viewport_loc=-2668%2C1176%2C5244%2C2572%2C0_0&invitationId=inv_0165d610-908
- DFD Level 1: <https://app.diagrams.net/?src=about#G1IBa3PPwJkU8muPNEltYAi7M4sujmwXE%7B%22pageId%22%3A%22wzwxThsYBGVyAbvD41E5%22%7D>
- DFD Level 2: https://lucid.app/lucidchart/f0ccf000-2737-42cf-b963-78265e91edd5/edit?viewport_loc=-4267%2C-2051%2C4318%2C1846%2C0_0&invitationId=inv_5cbe917d-ed50-474d-aa4b-0bafb094d52f
- Activity Diagrams:
- Shipment and tracking https://lucid.app/lucidchart/f0ccf000-2737-42cf-b963-78265e91edd5/edit?viewport_loc=-4267%2C-2051%2C4318%2C1846%2C0_0&invitationId=inv_5cbe917d-ed50-474d-aa4b-0bafb094d52f
- Order work flow <https://app.diagrams.net/?src=about>
- Order initiate and Payment https://lucid.app/lucidchart/cc8ad20d-f2b1-4f3a-8aca-c7a8a/edit?viewport_loc=-3295%2C-4191%2C5366%2C2294%2C0_0&invitationId=inv_8dc33a94-e1e1-45b9-ae1c-bba582d955e1

- Cancel Order https://lucid.app/lucidchart/38fe5a14-3d99-437b-b470-415166804e94/edit?viewport_loc=-3302%2C1569%2C3966%2C1696%2C0_0&invitationId=inv_c8717c07-d12