DIGITAL ASSIGNMENT - 1

Project Documentation - 2

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Entity – Relationship Diagram (Structural Modelling)

An Entity-Relationship (ER) Diagram is a graphical representation of a database that illustrates the relationships between entities (objects) within a system. It consists of entities (rectangles), attributes (ovals), and relationships (diamonds) connected by lines, helping in database design and structure visualization.

Detailed Breakdown of ER Diagram

1. Customer → Order (Total Participation)

- **Type:** 1:N (One customer can place multiple orders, but an order must belong to one customer).
- **Justification:** Every order must be placed by a customer. A customer may not place an order, but once an order is created, it must be linked to a customer.
- **Participation: Total for Order, Partial for Customer** (Not every customer places an order, but every order must belong to a customer).

2. Order → Item (Total Participation via Associative Entity: Order_Item)

- **Type:** M:N (One order can have multiple items, and one item can be present in multiple orders).
- **Justification:** Every order must contain at least one item, and each item can be part of multiple orders.
- **Participation: Total for Order, Partial for Item** (Every order must have items, but some items may not be ordered).

3. Order → Dark Store (Total Participation)

- **Type:** 1:N (One dark store processes multiple orders, but each order is fulfilled by a single dark store).
- **Justification:** Every order must be assigned to a dark store for fulfillment.
- **Participation: Total for Order, Partial for Dark Store** (Not all dark stores may have active orders, but every order must be fulfilled by a dark store).

4. Order → Delivery Personnel (Total Participation)

- **Type:** 1:N (One delivery personnel can deliver multiple orders, but each order is handled by only one delivery personnel).
- **Justification:** Every order must be assigned to a delivery personnel for delivery.

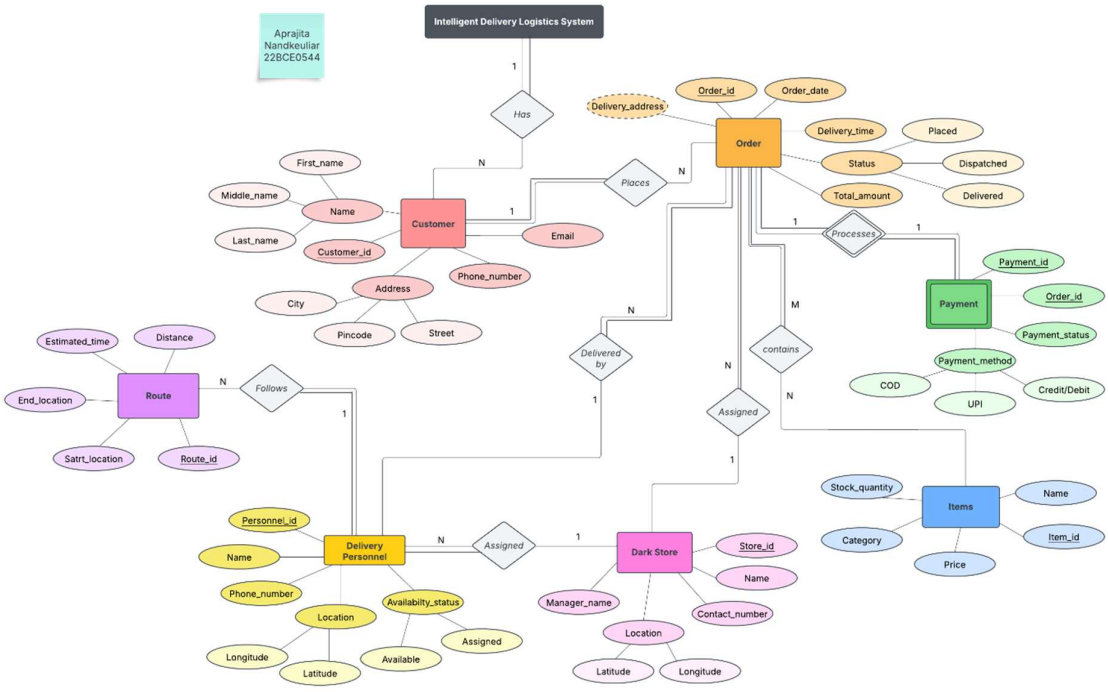
- **Participation: Total for Order, Partial for Delivery Personnel** (Not all delivery personnel may be assigned orders at a given time, but every order must have a delivery personnel).

5. Order → Route (Total Participation)

- **Type:** 1:N (One route can be used by multiple orders, but each order follows a single route).
- **Justification:** Every order must have a route to follow for delivery.
- **Participation: Total for Order, Partial for Route** (Every order requires a delivery route, but not all predefined routes may be used at a given time).

6. Order → Payment (Total Participation)

- **Type:** 1:1 (Each order has exactly one payment record, and each payment record belongs to one order).
- **Justification:** Every order must have a corresponding payment record.
- **Participation: Total for both Order and Payment** (Every order has a payment, and every payment belongs to an order).



Context Flow Diagram and Data Flow Diagram (Functional Modeling)

Context Flow Diagram

A Context Flow Diagram (CFD) is the highest-level DFD (Level 0) that provides an overview of the entire system by showing its interactions with external entities (customers, databases, services, etc.). It represents the system as a single process with input and output data flows.

Detailed Breakdown of Context Flow Diagram:

1. **Customer**
    - Sends Order Request → AI Logistics System
    - Receives Order Confirmation & Estimated Delivery Time ← AI Logistics System
    - Receives Order Delivery ← Delivery Personnel
    - Makes Payment → Payment Gateway
2. **Dark Store**
    - Receives Order Details → AI Logistics System
    - Sends Stock Availability & Order Packing Confirmation ← AI Logistics System
3. **Delivery Personnel**
    - Receives Delivery Assignment & Optimized Route → AI Logistics System
    - Sends Delivery Status Updates ← AI Logistics System
4. **Payment Gateway**
    - Processes Payment → AI Logistics System
    - Sends Payment Confirmation ← AI Logistics System

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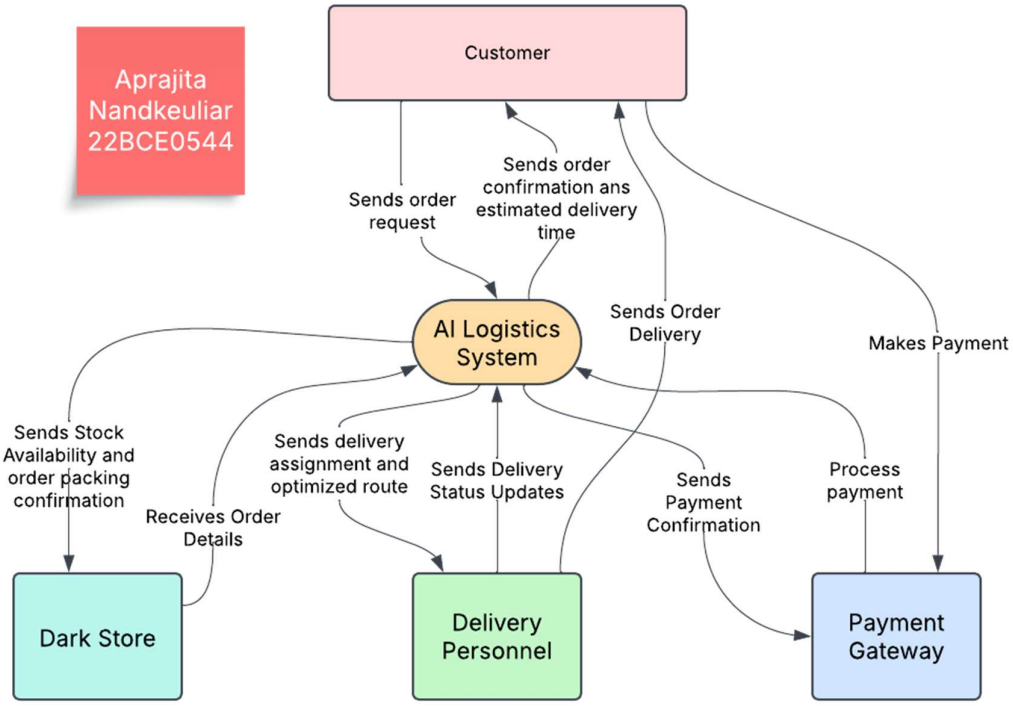


Data Flow Diagram

A Data Flow Diagram (DFD) is a graphical representation of how data moves through a system, illustrating the processes, data stores, external entities, and data flow between them. It helps in understanding the system's inputs, outputs, and processing steps at various levels of detail (e.g., Level 0, Level 1, Level 2).

Detailed Breakdown of Data Flow Diagram

1. Order Processing

- **Inputs (Arrows pointing to Order Processing process):**
    - Customer → Order Processing (Order request)
    - Payment Gateway → Order Processing (Payment status)
- **Outputs (Arrows leaving Order Processing process):**
    - Order Processing → Order Database (Saves order)
    - Order Processing → Inventory Management (Sends order details)
    - Order Processing → Customer (Sends order confirmation)

2. **Inventory Management**

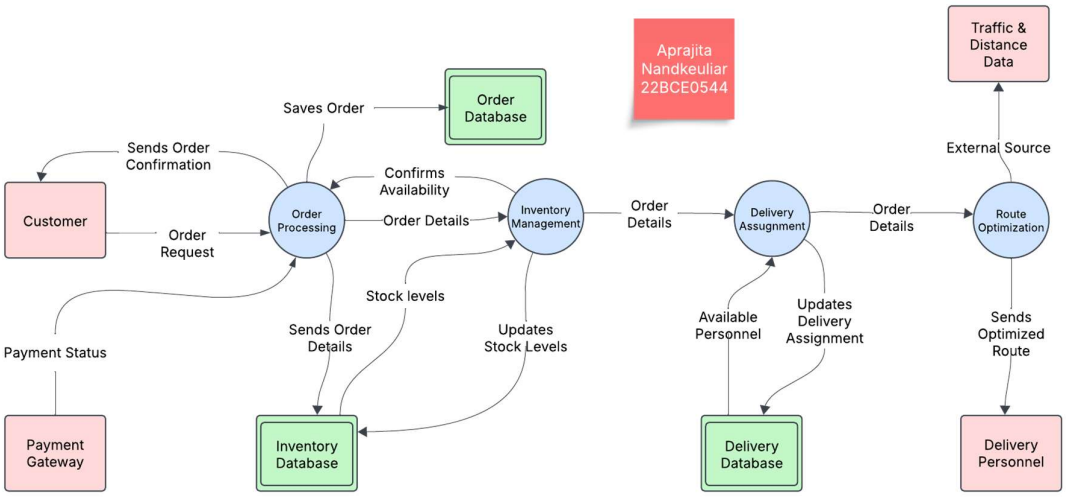
- **Inputs (Arrows pointing to Inventory Management process):**
    - Order Processing → Inventory Management (Order details)
    - Inventory Database → Inventory Management (Stock levels)
- **Outputs (Arrows leaving Inventory Management process):**
    - Inventory Management → Inventory Database (Updates stock)
    - **Inventory Management → Order Processing (Confirms availability)**

3. Delivery Assignment

- **Inputs (Arrows pointing to Delivery Assignment process):**
    - Order Processing → Delivery Assignment (Order details)
    - Delivery Database → Delivery Assignment (Available personnel)
- **Outputs (Arrows leaving Delivery Assignment process):**
    - Delivery Assignment → Delivery Database (Updates delivery assignment)
    - Delivery Assignment → Route Optimization (Sends delivery details)

4. Route Optimization

- **Inputs (Arrows pointing to Route Optimization process):**
    - Delivery Assignment → Route Optimization (Delivery details)
    - Traffic & Distance Data → Route Optimization (External source)
- **Outputs (Arrows leaving Route Optimization process):**
    - Route Optimization → Delivery Personnel (Sends optimized route)



State Transition Diagram (Behavioral Modeling)

State Transition Diagram for AI Logistics System (Zepto) A State Transition Diagram (STD) represents the different states of the AI Logistics System and how it transitions between them based on events like customer orders, inventory checks, and delivery updates.

Detailed Breakdown of State Transition Diagram

1. Idle State (Start)

- **Description:** The system is waiting for a new order.
- **Event:** Customer places an order.
- **Transition:** Moves to Order Received.

2. Order Received

- **Description:** System acknowledges a new order.
- **Event:** Order request is received from the customer.
- **Transition:** Moves to Inventory Check.

3. Inventory Check

- **Description:** System verifies if the ordered items are available in the nearest dark store.
- **Events & Transitions:**
    - If stock is available → Moves to Order Processing.
    - If out of stock → Moves to Order Canceled (notifies the customer).

4. Order Processing

- **Description:** Dark store packs the items for delivery.
- **Event:** Packing is completed.
- **Transition:** Moves to Assign Delivery Personnel.

5. Assign Delivery Personnel

- **Description:** System assigns the nearest available delivery personnel.
- **Event:** Delivery personnel is assigned.
- **Transition:** Moves to Route Optimization.

6. Route Optimization

- **Description:** System calculates the fastest delivery route.
- **Event:** Optimal route is determined.
- **Transition:** Moves to Out for Delivery.

7. Out for Delivery

- **Description:** Delivery personnel collects the package and starts delivery.
- **Events & Transitions:**
    - If delivery is successful → Moves to Order Delivered.
    - If delivery fails (e.g., wrong address, no response) → Moves to Reattempt Delivery.

8. Reattempt Delivery

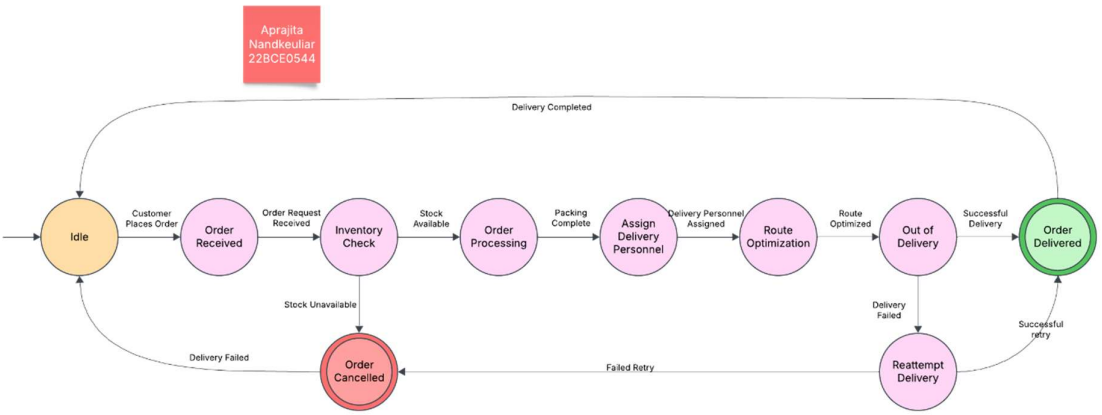
- **Description:** If the first delivery attempt fails, the delivery personnel retries delivery after contacting the customer.
- **Events & Transitions:**
    - If successful → Moves to Order Delivered.
    - If failed again → Moves to Order Cancelled.

9. Order Delivered (Final State)

- **Description:** The customer successfully receives the order, and payment is confirmed.
- **Event:** Delivery is marked complete.
- **Transition:** Moves back to Idle State (System is ready for the next order).

10. Order Canceled (Final State)

- **Description:** The order is canceled due to one of the following reasons:
    - Payment failure
    - Items out of stock
    - Multiple failed delivery attempts
- **Event:** Order is canceled and the customer is notified.
- **Transition:** Moves back to Idle State.



Link- https://lucid.app/lucidchart/3b1d7491-7891-4ba7-b6f4-91a935347c37/edit?viewport_loc=-1286%2C-506%2C5430%2C2768%2C0_0&invitationId=inv_293f0fa4-4a33-4e0f-8009-f9dfc20c459b