**1. Database Requirements for OLTP**

We’re building a **transactional system** (not analytical), so our schema must:

* **Record sales transactions** (orders, payments, returns)
* **Track inventory levels** across warehouses
* **Manage customers and products**
* Ensure **data consistency and fast reads/writes**
* Be **normalized (3NF)** for minimal redundancy

**2. Core Entities & Attributes**

**Customer**

* **CustomerID** (PK)
* FirstName
* LastName
* Email
* PhoneNumber
* Address
* CreatedAt

**Product**

* **ProductID** (PK)
* ProductName
* Category
* Brand
* Description
* Price
* CreatedAt

**Inventory**

* **InventoryID** (PK)
* **ProductID** (FK → Product)
* WarehouseLocation
* QuantityAvailable
* ReorderThreshold
* LastUpdated

**Order**

* **OrderID** (PK)
* **CustomerID** (FK → Customer)
* OrderDate
* OrderStatus (e.g., Placed, Shipped, Returned)
* TotalAmount

**OrderItem**

* **OrderItemID** (PK)
* **OrderID** (FK → Order)
* **ProductID** (FK → Product)
* Quantity
* UnitPrice
* Discount

**Payment**

* **PaymentID** (PK)
* **OrderID** (FK → Order)
* PaymentDate
* PaymentMethod (e.g., CreditCard, PayPal)
* AmountPaid
* PaymentStatus

**Optional (for returns, futureproofing)**

* **ReturnRequest**
  + ReturnID (PK)
  + OrderItemID (FK)
  + ReturnReason
  + Status
  + CreatedAt

**3. Relationships**

* Customer ⟶ Order: **One-to-Many**
* Order ⟶ OrderItem: **One-to-Many**
* Product ⟶ OrderItem: **One-to-Many**
* Product ⟶ Inventory: **One-to-One or One-to-Many** (if multi-warehouse)
* Order ⟶ Payment: **One-to-One or One-to-Many** (in case of partial payments)

**4. Normalization Summary**

* **1NF**: Atomic values, unique rows
* **2NF**: No partial dependencies (composite keys only where needed, like OrderItem)
* **3NF**: No transitive dependencies

**ER Diagram (Text Version)**

**Customer**

**└──<Order>───┬────<OrderItem>────┬──>Product**

**└──<Payment> └──>Inventory**

**OrderItem.ProductID → Product.ProductID**

**Order.CustomerID → Customer.CustomerID**

**Payment.OrderID → Order.OrderID**