P3. Database Design, Final ERD

Moving and Storage Rental Services

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Initial ERD:
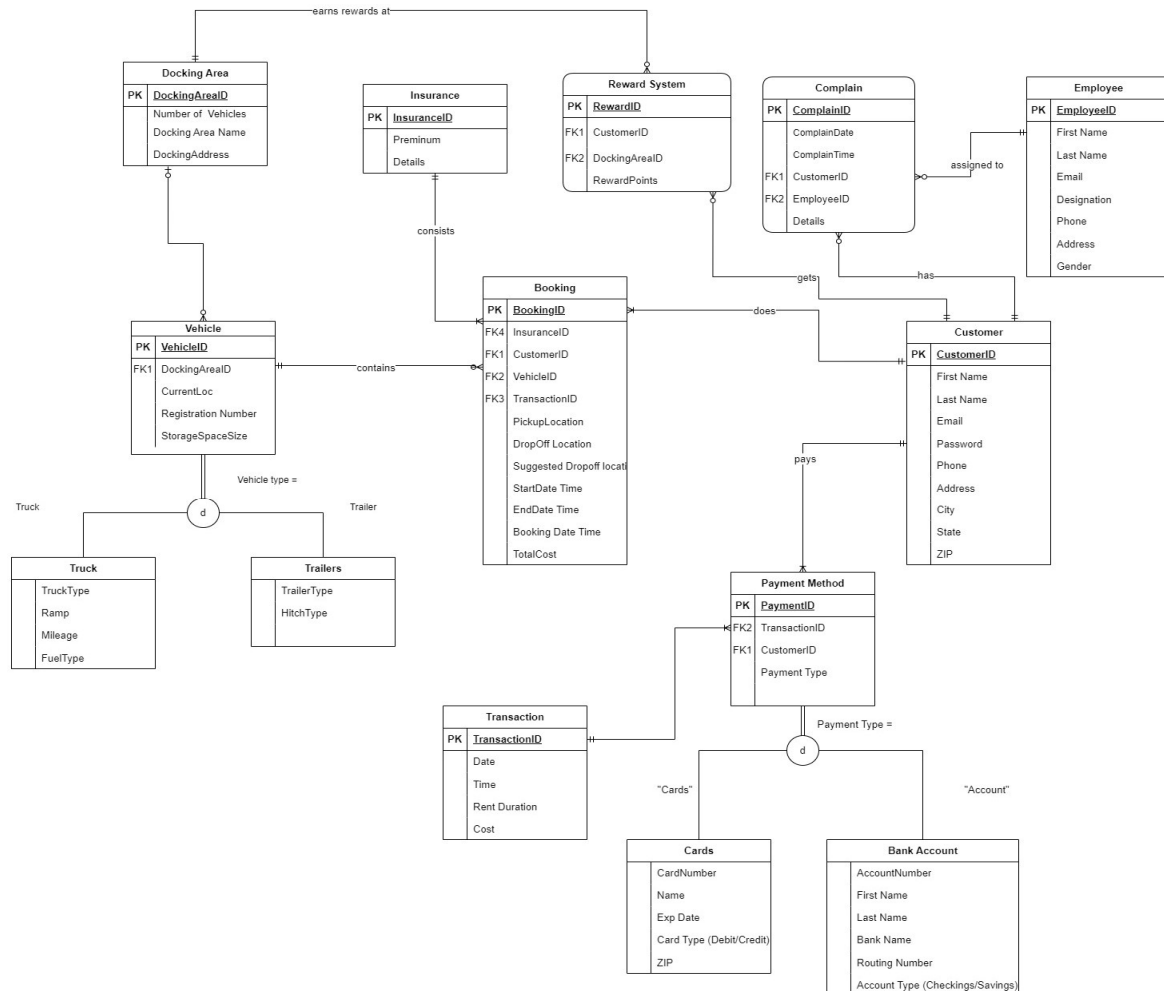
Entities and Attributes:

1. Customer:

- CustomerID (PK)

- FirstName

- LastName

- Email

- PhoneNumber

- Address

- Password

- City

- State

- Zip

2. Vehicle (SuperType):

- VehicleID (PK)

- RegistrationNumber

- CurrentLocation

- StorageSpaceSize

SubTypes: Truck:

- TruckID (PK)

- TruckType

- Ramp

- Mileage

- FuelType

Trailer:

- TrailerID (PK)

- Type

- HitchType

3. Booking:

- BookingID (PK)

- TotalCost

- CustomerID (FK1)

- VehicleID (FK2)

- TransactionID (FK3)

- PickupLocation

- DropoffLocation

- StartDate

- EndDate

- StartTime

- EndTime

- BookingDate

- BookingTime

4. PaymentMethod (SuperType):

- PaymentID (PK)

- CustomerID (FK1)

- PaymentType

SubTypes: Card:

- CardNumber (PK)

- ExpiryDate

- CardType

- Zip

BankAccount:

- BankName

- AccountNumber (PK)

- FirstName

- LastName

- RoutingNumber

- AccountType

5. Employee:

- EmployeeID (PK)

- FirstName

- LastName

- Email

- Designation

- Phone

- Address

- Gender

6. Complain:

- ComplainID (PK)
- Details
- Date
- Time
- CustomerID (FK)
- EmployeeID (FK)

7. RewardSystem:

- RewardID (PK)
- RewardPoints
- SuggestedDropoffLocation
- CustomerID (FK)

8. SuggestedDropOffLocations:

- SuggestedDropOffLocationID (PK)
- DockingAreaID (FK2)
- SuggestedDockingAddress (FK3)
- VehicleID (FK1)

9. DockingArea:

- DockingAreaID (PK)
- DockingAddress
- DockingAreaName

10. Insurance:

- InsuranceID (PK)
- BookingID (FK)
- Details

11. Transaction:

- TransactionID (PK)
- Cost
- Date
- Time
- RentDuration
- CustomerID (FK)
- PaymentID (FK)

Definition :

1. Entities:

1. **Customer:**

   - Description: Represents an individual or business entity using rental services.

   - Attributes:

     - CustomerID (PK): Unique identifier for each customer.

     - Name: Full name of the customer.

     - Email: Email address used for communication and notifications.

     - PhoneNumber: Contact number for the customer.

     - Address: Physical address of the customer.

2. **Vehicle (SuperType):**

   - Description: General category for all available rental vehicles.

   - Attributes:

     - VehicleID (PK): Unique identifier for each vehicle.

     - RegistrationNumber: Official registration number of the vehicle.

     - Manufacturer: The company that produced the vehicle.

     - Model: Specific model name or number.

     - CurrentLocation: Present location of the vehicle.

     - Status: Indicates if the vehicle is available, booked, under maintenance, etc.

   - SubTypes:

     - Truck: Vehicles primarily for cargo transport.

       - TruckSize: Size category, e.g., small, medium, large.

       - PayloadCapacity: Maximum weight it can carry.

       - RentalRate: Cost to rent the truck for a standard period.

     - Trailer: Non-motorized vehicles typically for transporting goods/materials.

       - TrailerSize: Dimensions or volume of the trailer.

       - Type: Indicates if it's enclosed, open, etc.

       - RentalRate: Cost to rent the trailer for a standard duration.

3. **Booking:**

   - Description: Records of vehicle reservation by customers.

   - Attributes:

     - BookingID (PK): Unique identifier for each booking.

- Date: When the booking was made.

- Duration: How long the vehicle is booked for.

- TotalCost: Total charge for the booking.

- CustomerID (FK): Refers to the customer making the booking.

- VehicleID (FK): Identifies the vehicle booked.

4. **PaymentMethod (SuperType):**

- Description: Different avenues for completing payment transactions.

- Attributes:

  - PaymentID (PK): Unique identifier for each payment method.

  - Type: General classification like card, bank transfer, etc.

- SubTypes:

  - Card: Payments via credit or debit cards.

    - CardNumber: Unique number on the card.

    - ExpirationDate: Date till which the card is valid.

    - CVV: Security code on the card.

    - CardType: Distinguishes between Visa, MasterCard, etc.

  - BankAccount: Direct payments from bank accounts.

    - BankName: Name of the bank.

    - AccountNumber: Unique identifier for the bank account.

    - BankBranch: Specific branch of the bank.

5. **Employee:**

- Description: Individuals part of the rental company's workforce.

- Attributes:

  - EmployeeID (PK): Unique identifier for each employee.

  - Name: Full name of the employee.

  - Role: Job designation or title.

  - Schedule: Working hours or shifts.

  - ContactDetails: Phone, email, or other contact information.

6. **Complain:**

- Description: Records of issues or grievances from customers.

- Attributes:

  - ComplainID (PK): Unique identifier for each complaint.

  - Description: Details of the complaint.

- Date: When the complaint was lodged.
- ResolutionStatus: Current status, e.g., resolved, pending.
- CustomerID (FK): Refers to the customer raising the complaint.
- EmployeeID (FK): Employee addressing the complaint.

7. **RewardSystem:**
   - Description: Loyalty or reward program for customers.
   - Attributes:
     - RewardID (PK): Unique identifier for each reward entry.
     - RewardPoints: Points earned or redeemed.
     - Description: Details about how points were earned or used.
     - EligibilityCriteria: Rules for earning or redeeming points.
     - CustomerID (FK): Refers to the associated customer.

8. **SuggestedDropOffLocations:**
   - Description: Advised places for customers to return vehicles.
   - Attributes:
     - LocationID (PK): Unique identifier for each location.
     - Address: Physical address of the drop-off location.
     - Proximity: Distance or closeness to key landmarks or centers.
     - VehicleID (FK): Refers to the vehicle associated with the suggested location.

9. **DockingArea:**
   - Description: Designated spots for vehicle pickups or returns.
   - **Attributes:**
     - DockingAreaID (PK): Unique identifier for each docking area.
     - Location: Address or coordinates of the docking area.
     - Capacity: Maximum number of vehicles it can hold.
     - Occupancy: Current number of vehicles parked.

10. **Insurance:**
- Description: Array of insurance options provided to customers.
- Attributes:
  - InsuranceID (PK): Unique identifier for each insurance type.
  - Type: Classification like collision damage waiver, personal accident insurance, etc.
  - CoverageDetails: What the insurance covers.
  - Cost: Price of opting for the insurance.

11. Transactions:

- Description: Documentation of financial interactions tied to bookings.

- Attributes:

    - TransactionID (PK): Unique identifier for each transaction.

    - Amount: Total cost involved in the transaction.

    - Date: When the transaction took place.

    - PaymentType: Mode like card, bank transfer, etc.

    - BookingID (FK): Associated booking record.

    - PaymentID (FK): Method used for the transaction.

Relationships and Cardinalities:

Relationships with Cardinalities and Explanations:

Customer to Booking:

- One-to-Many: One customer can make multiple bookings, but each booking is associated with only one customer.

2. Customer to PaymentMethod:

- One-to-Many: One customer can have multiple payment methods, but each payment method is linked to one customer.

3. Customer to RewardSystem:

- One-to-One: Each customer has one reward system and each reward system belongs to one customer.

4. Customer to Complain:

- One-to-Many: A customer can raise multiple complaints, but each complaint is raised by one customer.

5. Vehicle to Booking:

- One-to-Many: One vehicle can be booked multiple times, but each booking corresponds to one vehicle.

6. Truck and Trailer to Vehicle (SuperType to SubTypes):

- One-to-One: Each truck or trailer is a specific type of vehicle.

7. Booking to Transaction:

- One-to-One: Each booking has one corresponding transaction.

8. Booking to Insurance:

- One-to-Many: One booking can opt for multiple insurance types, but each insurance type is linked to one booking.

9. Employee to Complain:

- One-to-Many: An employee can address multiple complaints, but each complaint is addressed by one employee.

10. PaymentMethod to Transaction:

- One-to-Many: One payment method can be used for multiple transactions, but each transaction uses one payment method.

11. PaymentMethod to Card and BankAccount (SuperType to SubTypes):

- One-to-One: Each payment method is either a card or a bank account.

12. Vehicle to SuggestedDropOffLocations:

- One-to-Many: One vehicle can have multiple suggested drop-off locations, but each suggested location corresponds to one vehicle.

13. DockingArea to SuggestedDropOffLocations:

- One-to-Many: One docking area can be suggested for multiple vehicles, but each suggested location points to one docking area.

Changes based on the P2 initial draft ERD:

Entities and Attributes:

- **Added**:

  - Vehicle is now a super-type with sub-types **Truck** and **Trailer**.

  - PaymentMethod is introduced as a super-type with sub-types **Card** and **BankAccount**.

  - Added entities like **Complain**, **RewardSystem**, **SuggestedDropOffLocations**, **DockingArea**, and **Transaction**.

- **Modified**:

  - The **Customer** entity now has more detailed attributes like **FirstName**, **LastName**, **Email**, etc.

  - The **Booking** entity now includes attributes related to the pickup and drop-off of the vehicle.

  - The **Employee** entity has been expanded to include more attributes.

- **Removed**:

  - No explicit mention of entities like **Location**, **Storage Unit**, **Inventory Items**, and **Customer Interactions** in the new ERD.

2. **Definitions**:

- **Added**:

  - Detailed definitions for the new entities have been provided.

- **Modified**:

- The definitions of entities like **Vehicle**, **Customer**, **Booking**, and **Employee** have been updated to align with the new attributes and entity structures.

3. **Relationships and Cardinalities**:

   - **Added**:

     - New relationships have been introduced, such as between **Customer** and **Complain**, **Booking** and **Insurance**, and **Vehicle** and **SuggestedDropOffLocations**.

     - The relationship between the super-type and sub-types (**Vehicle** to **Truck** and **Trailer**, **PaymentMethod** to **Card** and **BankAccount**) has been clearly defined.

   - **Modified**:

     - The relationship between entities like **Customer** and **Booking**, **Vehicle** and **Booking** has been refined.

   - **Removed**:

     - Some relationships from the old ERD, like between **Vehicle** and **Booking** (optional), **Storage Unit** and **Location**, are not explicitly mentioned in the new ERD.

Clarification:

- The new ERD appears to be more refined and specific, focusing primarily on the vehicle rental aspect. It provides a clearer distinction between vehicle types and payment methods.

- The separation of **Vehicle** into a super-type and sub-types (**Truck** and **Trailer**) allows for better categorization of vehicles.

- The introduction of entities related to complaints, rewards, suggested drop-off locations, docking areas, and transactions provides a more comprehensive view of the rental process and customer experience.

- Some entities and relationships present in the old ERD, such as those related to storage units, inventory items, and customer interactions, are not present in the new ERD. It's possible that these aspects are either no longer relevant or are being managed separately.

In summary, the new ERD seems to be a more streamlined representation focusing on the core aspects of vehicle rentals, payments, and associated services. The changes enhance the clarity and specificity of the data model.