Part B / Normalized Database Design

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Functional Dependencies

We define the functional dependencies (FDs) for the given relation.
The relation **VisitData** represents by the following attributes:

VisitData(VisitID, Restaurant, ServerEmpID, ServerName, StartDateHired,EndDateHired, HourlyRate, ServerBirthDate, ServerTIN, VisitDate, VisitTime,MealType, PartySize, Genders, WaitTime, CustomerName, CustomerPhone,CustomerEmail, LoyaltyMember, FoodBill, TipAmount, DiscountApplied, PaymentMethod, OrderedAlcohol, AlcoholBill)}

Functional Dependencies:

1. Restaurant → RestaurantID, RestaurantName, Location
   Explanation: A unique restaurant name determines its ID and location.
2. ServerEmpID → ServerName, StartDateHired, EndDateHired,
   HourlyRate, ServerBirthDate, ServerTIN
   Explanation: A unique Server Employee ID determines details about the server, including name, employment dates, hourly rate, birth date, and TIN (Taxpayer Identification Number).
3. CustomerPhone → CustomerName, CustomerEmail, LoyaltyMember
   Explanation: A unique customer phone determines their name, email, and loyalty membership.
4. CustomerEmail → CustomerName, CustomerPhone, LoyaltyMember
   Explanation: A unique customer email determines their name, phone number, and loyalty membership status.
5. PaymentMethod → PaymentMethodID, PaymentMethodName
   Explanation: A unique payment method determines its ID and name (e.g., Cash, Credit Card).
6. MealType → MealTypeID, MealDescription
   Explanation: A unique meal type determines its ID and description.
7. VisitID → Restaurant, ServerEmpID, VisitDate, VisitTime,
   MealType, PartySize, Genders, WaitTime, CustomerName,
   CustomerPhone, CustomerEmail, LoyaltyMember, FoodBill, TipAmount,
   DiscountApplied, PaymentMethod, OrderedAlcohol, AlcoholBill
   Explanation: A unique visit ID determines all details of a visit, including restaurant, server, meal type, party size, customer details, bills, discounts, and payment method.

Decomposition to 3NF

Using the functional dependencies and normalization rules, we decompose the original relation into multiple relations satisfying **Third Normal Form (3NF):**

Relations:

1. **Restaurant** (*RestaurantID [PK], RestaurantName*)
2. **Server** (*ServerEmpID [PK], ServerName, StartDateHired, EndDateHired, HourlyRate, ServerBirthDate, ServerTIN*)
3. **Customer** (*CustomerID [PK], CustomerName, CustomerPhone, CustomerEmail, LoyaltyMember*)
4. **PaymentMethod** (*PaymentMethodID [PK], PaymentMethodName*)
5. **MealType** (*MealTypeID [PK], MealTypeName*)
6. **Visit** (*VisitID [PK], RestaurantID [FK], ServerEmpID [FK], CustomerID [FK], VisitDate, VisitTime, MealTypeID [FK], PartySize, Genders, WaitTime, FoodBill, TipAmount, DiscountApplied, PaymentMethodID [FK], OrderedAlcohol, AlcoholBill*)

Entity-Relationship Diagram

ER Diagram on Lucidchart