

# 1. Entity-Relationship (ER) Model

## Entities and Attributes

Entity	Attributes
Customer	CustomerID (PK, INT), Name (VARCHAR2(100)), Email (VARCHAR2(100)), PhoneNumber (VARCHAR2(20)), LicensePlate (VARCHAR2(20))
Parking Lot Operator	OperatorID (PK, INT), Name (VARCHAR2(100)), ContactInformation (VARCHAR2(150))
Parking Space	ParkingSpaceID (PK, INT), Location (VARCHAR2(100)), SlotNumber (VARCHAR2(10)), AvailabilityStatus (VARCHAR2(20)), ParkingType (VARCHAR2(20)), PricePerHour (DECIMAL (6,2)), OperatorID (FK)
Reservation	ReservationID (PK, INT), CustomerID (FK), ParkingSpaceID (FK), StartTime (DATE), EndTime (DATE), PaymentStatus (VARCHAR2(20)), ReservationStatus (VARCHAR2(20))

## 2. Relationships & Constraints

Relationship	type	Details
Customer → Reservation	1 : Many	A customer can have multiple reservations.

ParkingSpace → Reservation	1 : Many	A parking space can be reserved multiple times (different times).
ParkingLotOperator → ParkingSpace	1 : Many	An operator manages many parking spaces.

## Constraints Applied

Constraint Type	Description
Not Null	Name, Email, PhoneNumber
Unique	Email must be unique in Customer table.
Primary Key	Each entity has a unique identifier (ID).
Foreign Key	Enforce relational integrity between tables (e.g., Reservation.CustomerID → Customer.CustomerID).
Check	Specific allowed values for AvailabilityStatus, ParkingType, PaymentStatus, ReservationStatus.

## Data Types

- ★ INT
  - For IDs
- ★ VARCHAR2
  - For text fields (names, emails, phone numbers, etc.)
- ★ DECIMAL
  - For prices (up to 9999.99)
- ★ DATE
  - reservation timestamps

### 3. Normalization

- **1NF:** Atomic attributes
- **2NF:** No partial dependencies
- **3NF:** No transitive dependencies

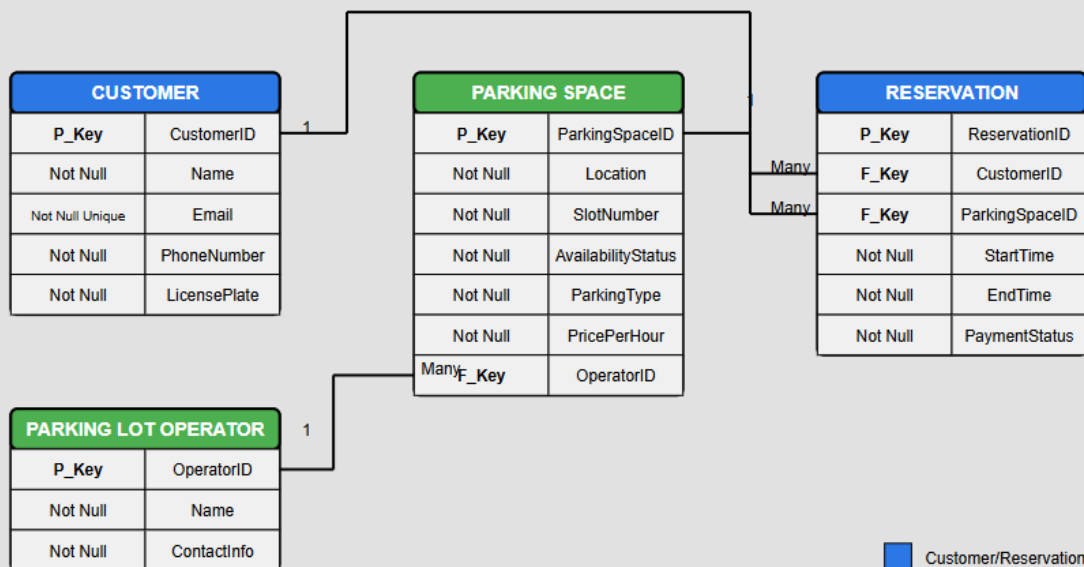
### 4. Handling Data Scenarios

The logical model supports:

- **Multiple reservations** by the same customer at different times.
- **Dynamic parking availability** (AvailabilityStatus updates as reservations are made/canceled).
- **Multiple operators managing different parking spaces.**
- **Secure data handling** (valid email, payment statuses, reservation statuses).
- **Pricing flexibility** based on different parking types.

### 5. Presentation & Documentation

 **Full Database Structure**



Customer/Reservation Entities  
Parking Management Entities