PARKING LOT SYSTEM LLD

OVERVIEW

1. Parking Vehicles
2. Collecting Payments
3. Managing the available space efficiently

RULES OF THE SYSTEM

1. SETUP :
   1. Multiple slots available for vehicles.
   2. Different vehicle type occupy different slot sizes.
   3. Each vehicle gets parking ticket upon entry.
   4. System calculates parking fee based on duration of stay and vehicle type.
2. EXIT AND PAYMENT :
   1. Vehicle must complete its payment before exiting.
   2. Multiple payment methods supported (Cash,Card,UPI).
   3. Once payment is successful , vehicle exits and slot is freed.

KEY REQUIREMENTS

1. A parking lot with multiple slot types.
2. Dynamic slot allocation based on vehicle size.
3. Payment processing with multiple methods.
4. Entry ticket issuance and exit validation.

KEY COMPONENTS

1. Vehicle
2. ParkingLot
3. ParkingSlot

PATTERNS

1. Strategy Pattern : for Payment Strategy and Parking Fares -> diff strategy for diff payment modes.
2. Factory Pattern : for Vehicle Creation -> will allow easy extension for new vehicle types.
3. Singleton Pattern : for Parking Lot -> ensure only one parking lot exists.

DESIGN

Vehicle

String licensePlate,
String vehicleType,
PaymentStrategy feeStrategy

String getLicensePlate(),
String getVehicleType(),
calculateFee(vehicleType,duration,durationType)

SmallVehicle

MediumVehicle

LargeVehicle

VehicleRateStrategy

calculateFee(vehicleType,duration,durationType)

BasicHourlyRateStrategy

calculateFee(vehicleType,duration,durationType)

PremiumRateStrategy

calculateFee(vehicleType,duration,durationType)

Payment

double amount,
PaymentStrategy strategy
void processPayment(fee)

PaymentStrategy

void processPayment(fee)

CashPaymentStrategy

void processPayment(fee)

OnlinePaymentStrategy

void processPayment(fee)

DurationType

Hours,
Days

ParkingLot

List<ParkingSlot> parkingSlots

ParkingSlot findAvailableSlot(vehicleType),
parkVehicle(vehicle)
vacateSlot(parkingSlot,vehicle)

ParkingSlot

int slotNumber,
boolean isOccupied,
Vehicle vehicle,
String slotType

boolean isOccupied(),
boolean canParkVehicle(vehicle),
void parkVehicle(vehicle)
void vacate()

SmallParkingSlot

boolean canParkVehicle(vehicle)

MedParkingSlot

boolean canParkVehicle(vehicle)

LargeParkingSlot

boolean canParkVehicle(vehicle)

VehicleFactory

createVehicle(licenseplate,vehicletype,feeStrategy)