Back To Course Home

Grokking the Object Oriented Design Interview

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Search Course

Object-Oriented Design and UML

- Object-Oriented Basics
- OO Analysis and Design
- What is UML?
- Use Case Diagrams
- Class Diagram
- Sequence diagram
- Activity Diagrams

Object Oriented Design Case Studies

- Design a Library Management System
- Design a Parking Lot
- Design Amazon - Online Shopping System
- Design Stack Overflow
- Design a Movie Ticket Booking System
- Design an ATM
- Design an Airline Management System
- Design Blackjack and a Deck of Cards
- Design a Hotel Management System
- Design a Restaurant Management system
- Design Chess
- Design an Online Stock Brokerage System
- Design a Car Rental System
- Design LinkedIn
- Design Cricinfo
- Design Facebook - a social network

Appendix

- Contact us
- Other courses

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Design a Hotel Management System

Let's design a hotel management system.

We'll cover the following

- System Requirements
- Use case diagram
- Class diagram
- Activity diagrams
- Code

A Hotel Management System is a software built to handle all online hotel activities easily and safely. This System will give the hotel management power and flexibility to manage the entire system from a single online portal. The system allows the manager to keep track of all the available rooms in the system as well as to book rooms and generate bills.

System Requirements

We'll focus on the following set of requirements while designing the Hotel Management System:

1. The system should support the booking of different room types like standard, deluxe, family suite, etc.
2. Guests should be able to search the room inventory and book any available room.
3. The system should be able to retrieve information, such as who booked a particular room, or what rooms were booked by a specific customer.
4. The system should allow customers to cancel their booking - and provide them with a full refund if the cancelation occurs before 24 hours of the check-in date.
5. The system should be able to send notifications whenever the booking is nearing the check-in or check-out date.
6. The system should maintain a room housekeeping log to keep track of all housekeeping tasks.
7. Any customer should be able to add room services and food items.
8. Customers can ask for different amenities.
9. The customers should be able to pay their bills through credit card, check or cash.

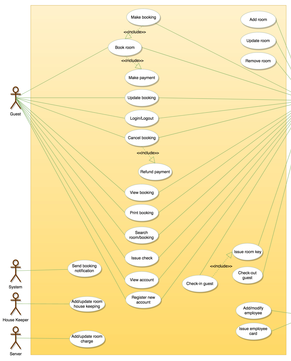
Use case diagram

Here are the main Actors in our system:

- **Guest:** All guests can search the available rooms, as well as make a booking.
- **Receptionist:** Mainly responsible for adding and modifying rooms, creating room bookings, check-in, and check-out customers.
- **System:** Mainly responsible for sending notifications for room booking, cancellation, etc.
- **Manager:** Mainly responsible for adding new workers.
- **Housekeeper:** To add/modify housekeeping record of rooms.
- **Server:** To add/modify room service record of rooms.

Here are the top use cases of the Hotel Management System:

- **Add/Remove/Edit room:** To add, remove, or modify a room in the system.
- **Search room:** To search for rooms by type and availability.
- **Register or cancel an account:** To add a new member or cancel the membership of an existing member.
- **Book room:** To book a room.
- **Check-in:** To let the guest check-in for their booking.
- **Check-out:** To track the end of the booking and the return of the room keys.
- **Add room charge:** To add a room service charge to the customer's bill.
- **Update housekeeping log:** To add or update the housekeeping entry of a room.

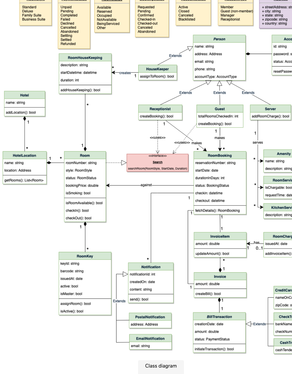


Use case diagram

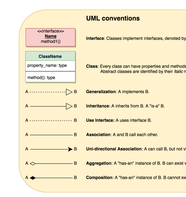
Class diagram

Here are the main classes of our Hotel Management System:

- **Hotel and HotelLocation:** Our system will support multiple locations of a hotel.
- **Room:** The basic building block of the system. Every room will be uniquely identified by the room number. Each Room will have attributes like Room Style, Booking Price, etc.
- **Account:** We will have different types of accounts in the system; one will be a guest to search and book rooms, another will be a receptionist. Housekeeping will keep track of the housekeeping records of a room, and a Server will handle room service.
- **RoomBooking:** This class will be responsible for managing bookings for a room.
- **Notification:** Will take care of sending notifications to guests.
- **RoomHouseKeeping:** To keep track of all housekeeping records for rooms.
- **RoomCharge:** Encapsulates the details about different types of room services that guests have requested.
- **Invoice:** Contains different invoice-items for every charge against the room.
- **RoomKey:** Each room can be assigned an electronic key card. Keys will have a barcode and will be uniquely identified by a key-ID.

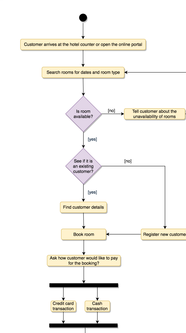


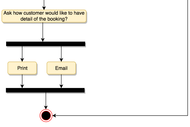
Class diagram



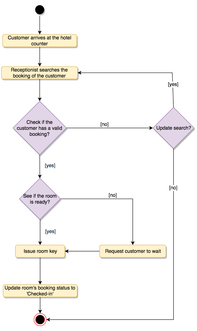
Activity diagrams

Make a room booking: Any guest or receptionist can perform this activity. Here are the set of steps to book a room:

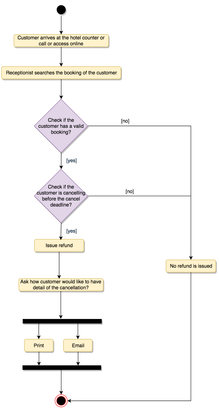




Check in: Guest will check in for their booking. The Receptionist can also perform this activity. Here are the steps:



Cancel a booking: Guest can cancel their booking. Receptionist can perform this activity. Here are the different steps of this activity:



Code

Here is the high-level definition for the classes described above.

Enums, data types, and constants: Here are the required enums, data types, and constants:

Java | Python

```java
public enum RoomStyle {
  STANDARD, DELUXE, FAMILY_SUITE, BUSINESS_SUITE
}

public enum RoomStatus {
  AVAILABLE, RESERVED, OCCUPIED, NOT_AVAILABLE, BEING_SERVICED, OTHER
}

public enum BookingStatus {
  REQUESTED, PENDING, CONFIRMED, CHECKED_IN, CHECKED_OUT, CANCELLED, ABANDONED
}

public enum AccountStatus {
  ACTIVE, CLOSED, CANCELED, BLACKLISTED, BLOCKED
}

public enum AccountType {
  MEMBER, GUEST, MANAGER, RECEPTIONIST
}

public enum PaymentStatus {
  UNPAID, PENDING, COMPLETED, FILLED, DECLINED, CANCELLED, ABANDONED, SETTLING, SETTLED, REFUNDED
}

public class Address {
  private String streetAddress;
  private String city;
  private String state;
```

Account, Person, Guest, Receptionist, and Server: These classes represent the different people that interact with our system:

Java | Python

```java
// For simplicity, we are not defining getter and setter functions. The reader can
// assume that all class attributes are private and accessed through their respective
// public getter method and modified only through their public setter method.

public class Account {
  private String id;
  private String password;
  private AccountStatus status;

  public boolean resetPassword();
}

public abstract class Person {
  private String name;
  private Address address;
  private String email;
  private String phone;

  private Account account;
}


public class Guest extends Person {
  private int totalRoomsCheckedIn;

  public List<RoomBooking> getBookings();
}
```

Hotel and HotelLocation: These classes represent the top-level classes of the system:

Java | Python

```java
public class HotelLocation {
  private String name;
  private Address location;

  public Address getRooms();
}

public class Hotel {
  private String name;
  private List<HotelLocation> locations;

  public boolean addLocation(HotelLocation location);
}
```

Room, RoomKey, and RoomHouseKeeping: To encapsulate a room, room key, and housekeeping:

Java | Python

```java
public interface Search {
  public static List<Room> search(RoomStyle style, Date startDate, int duration);
}

public class Room implements Search {
  private String roomNumber;
  private RoomStyle style;
  private RoomStatus status;
  private double bookingPrice;
  private boolean isSmoking;

  private List<RoomKey> keys;
  private List<RoomHouseKeeping> houseKeepingLog;

  public boolean isRoomAvailable();
  public boolean checkIn();
  public boolean checkOut();

  public static List<Room> search(RoomStyle style, Date startDate, int duration) {
    // return all rooms with the given style and availability
  }
}

public class RoomKey {
  private String keyId;
  private String barcode;
  private Date issueDAt;
  private boolean active;
```

RoomBooking and RoomCharge: To encapsulate a booking and different charges against a booking:

Java | Python

```java
public class RoomBooking {
  private String reservationNumber;
  private Date startDate;
  private int durationInDays;
  private BookingStatus status;
  private Date checkin;
  private Date checkout;

  private int guestID;
  private Room room;
  private Invoice invoice;
  private List<Notification> notifications;

  public static RoomBooking fectchDetails(String reservationNumber);
}

public abstract class RoomCharge {
  public Date issueAt;
  public boolean addInvoiceItem(Invoice invoice);
}

public class Amenity extends RoomCharge {
  public String name;
  public String description;
}

public class RoomService extends RoomCharge {
  public boolean isChargeable;
```