

Restaurant

- Can you design a restaurant?



九章算法

Clarify

关键字： Restaurant

- What

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九章算法

Clarify

- What
- How
- Who

九章算法

预定类面向对象设计

文泰来 老师

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Clarify

◎ 九章算術

- What

关键字: Restaurant

管理: ?
Party / Table



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What

关键字： Restaurant

属性： ?



What

关键字： Restaurant

属性： ?



- 吧台



- 大堂



- 包间

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Clarify



What

关键字： Restaurant

- What

关键字： Restaurant, Party, Table



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Clarify

◎ 章算法

Clarify

◎ 章算法

- 针对本题

大堂，所有桌子都一样



What

关键字： Restaurant



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◎ 章算法

Clarify

- How

规则？



- 桌子的规格不一样，能坐的人数区别
- 吧台里，party的区分
- 收费？

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- 是否能够预约？

◎ 章算法

Clarify

关键字： Restaurant



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Clarify

◎ 九章算法

Clarify

◎ 九章算法

- How



- 每个Order需要区分是Dine-in还是Dine-out

Optional, 通过思考题目当中是否有人的出现，来帮助确定解题范围

*一般可以考虑人的角色以及人的属性，看是否题目需要

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Clarify

◎ 九章算法

Clarify

◎ 九章算法

- How



- 是否能够送外卖？

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Clarify

◎ 九章算法

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◎ 九章算法

- 针对本题

没有Reservation
没有Dine-out

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Clarify

需求
★
需求

- Who



Party ?

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Clarify

需求
★
需求

- Who

思考模式2:

1. 客人进入餐馆，餐馆返回一个Table
2. 客人点菜，餐馆返回一桌菜
3. 客人付账，餐馆清空Table

Input → **BLACK BOX** → Output

Clarify

需求
★
需求

- Who

人物越多越复杂

思考模式1:



Party 进入餐馆 -> Host指引到空桌 (find table) ->
一个waiter 负责这桌客人 (assign waiter) -> 客人点菜 (take order) ->
Chief 拿到order, 按顺序做菜 (cook by order) -> Order 做好后, waiter 上菜
(serve order) -> 客人吃完后付钱 (check out)

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Clarify

需求
★
需求

- Who

思考模式1:



Party 进入餐馆 -> Host指引到空桌 (find table) ->
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Clarify

◎ 九章算術

Core Object

◎ 九章算術

- Who

思考模式2:



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Clarify

◎ 九章算術

Core Object

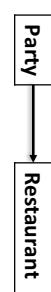
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- Who

思考模式1:



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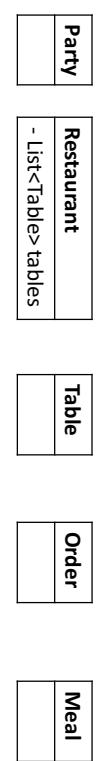
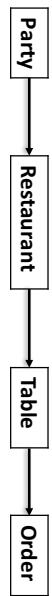


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Core Object



Core Object

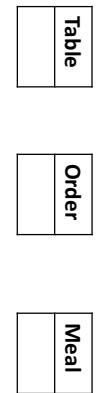


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Core Object



Core Object



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Core Object



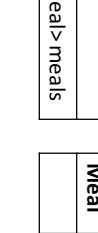
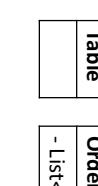
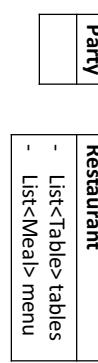
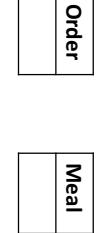
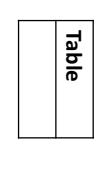
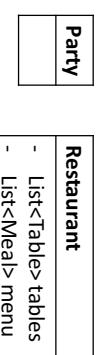
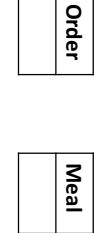
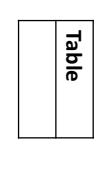
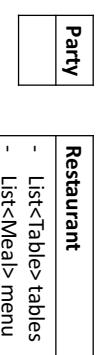
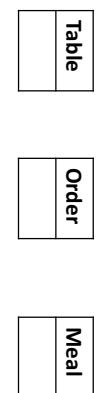
Core Object



Core Object



Core Object



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Cases



Cases



- Party
- Make order ?
- Restaurant
- Find table

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Cases



Cases



- Party

- Restaurant

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Cases

Cases

Cases

Cases

- Restaurant
 - Find table
 - Take Order
 - Checkout
- Order
 - N/A

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Cases

Cases

Cases

Cases

- Restaurant

- Find table
- Take Order

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Use case summary



Use case summary



- Management 类常见 use case

Reserve:

Serve:

Checkout:

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Cases



Use case summary



- Meal

- N/A

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Cases



Use case summary



- Management 类常见 use case

Reserve: 暫不考慮

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Use case summary

需求
用例

Class

需求
用例

- Management 管理 Use case

- Use case: Find table

Reserve: 暫不考慮

Serve: Find table, take order

Checkout: checkout

- Restaurant find an available table, an change the table to be unavailable

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Use case summary

需求
用例

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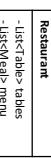
需求
用例

- Management 常用 Use case

Reserve: 暫不考慮

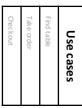
Serve: Find table

Checkout: checkout

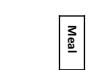
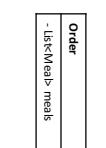
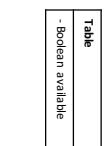
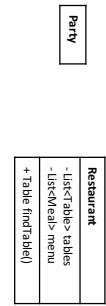


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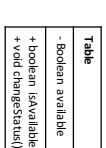
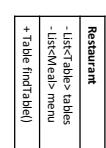


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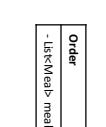
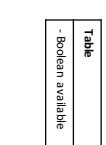
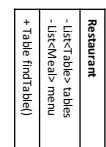
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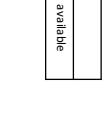
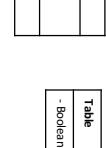
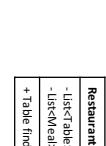
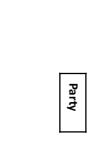
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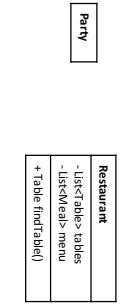


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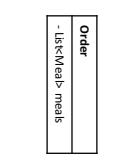
Best practice



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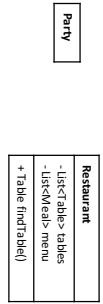
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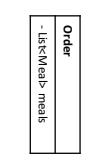
Best practice



Class



- Use case: Take order
- Restaurant takes an order



- Use case: Take order
- Restaurant takes an order



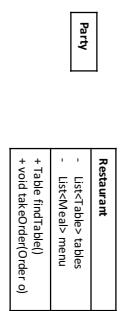
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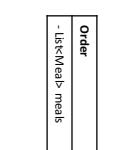
Class



Option 1



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Class



Class



- Use case: Check out

- Restaurant checks out a table/order, mark the table available again
- Calculate order price

- Option 1: Order 里面记录 Table 信息
- Option 2: Table 里面记录 Order 信息

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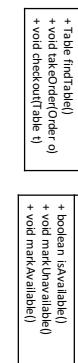
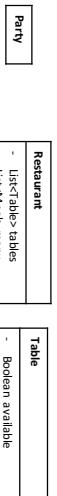
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Option 1



Option 1



- Single responsibility principle
- Force Table – Order mapping



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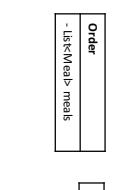
Option 1



Option 1



- Single responsibility principle



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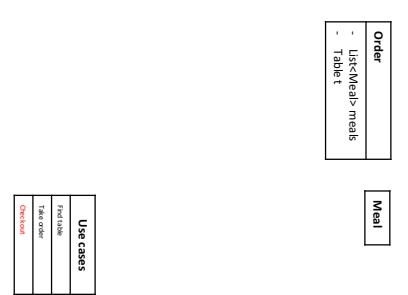
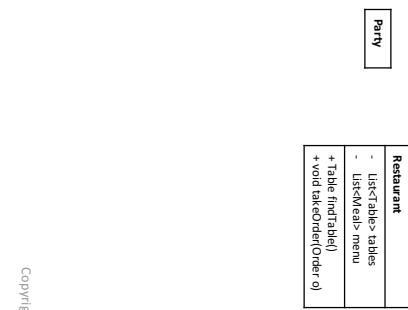


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Option 2



Option 2



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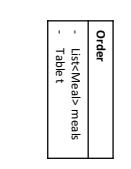
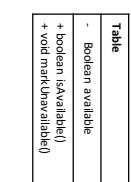
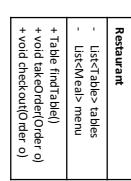
Option 1



Option 2



- Single responsibility principle
- Force Table – Order mapping
- Share table use case



Option 2



Option 2



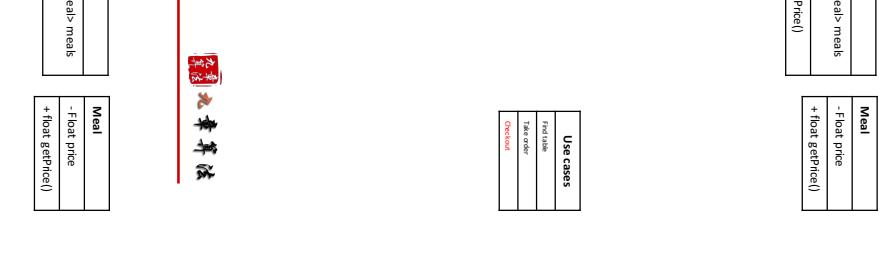
Option 2



Option 2



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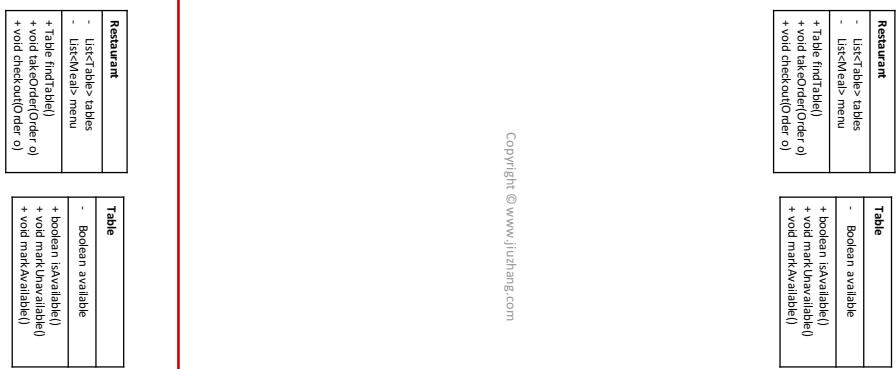


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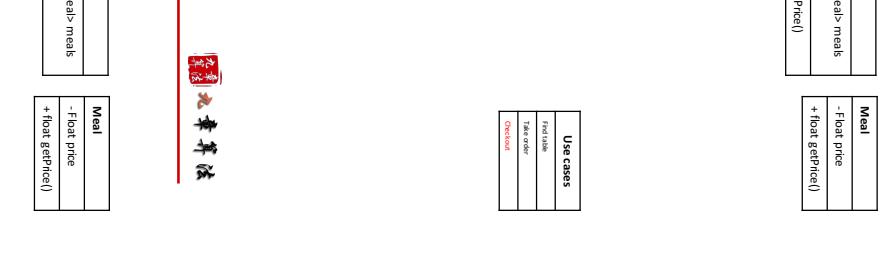
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Challenge

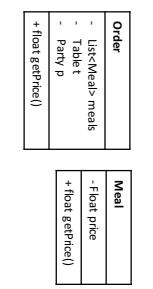
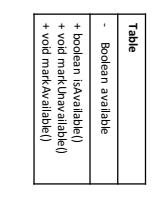
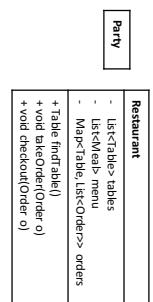
- How to mark a table available?



Correctness

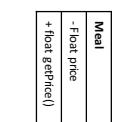
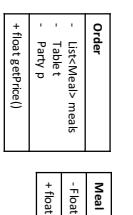
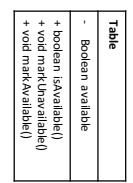
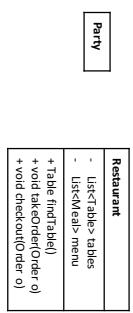


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Class



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Challenge



- 桌子大小不同？

Party
- Int capacity + int getCapacity()

Table
- Boolean available
+ boolean isAvailable()
+ void markUnavailable()
+ void markAvailable()

Order	Meal
- List<Meal> meals	- Float price
- Tablet	+ float getPrice()
- Party p	
+ float getPrice()	

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Correctness



- 桌子大小不同?

Party & Table Capacity

Find table based on capacity

NotableException

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Challenge



- 桌子大小不同？

```

Restaurant
- List<Table> tables
- List<Menu> menu
- Map<Table, List<Order>> orders
+ Table findTable()
+ void takeOrder(Order o)
+ void checkout(Order o)

```

Table
- Boolean available
+ boolean isAvailable()
+ void markUnavailable()
+ void markAvailable()

Order	Meal
- List<Meal> meals	- Float price
- Tablet	+ float getPrice()
- Party p	
+ float getPrice()	

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Challenge



- 桌子大小不同?

Party & Table Capacity

Find table based on capaci

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Challenge

- How can you change your design to support reservation in your restaurant?



预定类算法

预定类题库

- Restaurant reservation system

Challenge

预定类算法

课程大纲

预定类OOD题型

- 预定类OOD解题思路
- Hotel reservation system
- Booking.com

Restaurant
- List<Table> tables
- Map<Table, List<Order>> orders
+ int getCapacity()
+ Table findTable()
+ void takeOrder(Order o)
+ void checkout(Order o)
+ getCapacity()

Party
- int capacity
+ int getCapacity()

Table
- Boolean available
- int capacity
+ Table findTable()
+ void markAvailable()
+ void markUnavailable()
+ float getPrice()

Order
- List<Meal> meals
- Table t
- Party p
+ float getPrice()

Meal
- float price
+ float getPrice()

NotableException

Use cases
- Reservate
- Take order
- Check out

预定类题库

九章算法

- Restaurant reservation system
- Hotel reservation system
- Flight/Bus/Train reservation system

预定类题目特点

九章算法

- 频率： 中
- 难度： 高

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预定类题库

九章算法

- Restaurant reservation system
- Hotel reservation system

预定类题目特点

九章算法

- 频率： 中

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预定类题目解题思路

九章算术

预定类题目解题思路

九章算术

- What

- 考虑预定的东西

例子：机票

- Cancel

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预定类题目解题思路

九章算术

预定类题目解题思路

九章算术

- What

- 考虑预定的东西

例子：机票

机舱/座位号/...

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Reservation

九章算术

Reservation

九章算术

- 有哪些需要和面试官统一的contract?

- Search criteria

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预定类题目解题思路

九章算术

Reservation

九章算术

- Use case

- 有哪些需要和面试官统一的contract?

Search criteria -> Search() -> List<Result> -> Select() -> Receipt

Search criteria -> Search() -> List<Result> -> Select() -> Receipt

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Reservation



Reservation



- Search criteria

Make a reservation

2 people	Oct 10, 2017	7:00 PM	Find a Table
----------	--------------	---------	------------------------------

- 人数: 无拼桌, 每张桌子大小相同, 不会有超过桌子大小的人数

- 日期: 是否允许预定多日以后的?
- 时间: 是否所有时间都允许预定?

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Reservation



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Reservation



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Reservation



Reservation



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- 日期：是否允许预定多日以后的？ - 允许
- 时间：是否所有时间都允许预定？ - 24/7

- Design: FindTableForReservation(Timeslot t)

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Reservation



Reservation



- Search criteria

Make a reservation

2 people	Oct 10, 2017	7:00 PM	Find a Table
----------	--------------	---------	---------------------

- 人数：无拼桌，每张桌子大小相同，不会有超过桌子大小的人数
- 日期：是否允许预定多日以后的？ - 允许
- 时间：是否所有时间都允许预定？ - 24/7

- Design: FindTableForReservation(Timeslot t)
- Timeslot contains Date and time

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Reservation



Reservation



- Search criteria

Make a reservation

2 people	Oct 10, 2017	7:00 PM	Find a Table
----------	--------------	---------	---------------------

- 人数：无拼桌，每张桌子大小相同，不会有超过桌子大小的人数
- 日期：是否允许预定多日以后的？ - 允许
- 时间：是否所有时间都允许预定？ - 24/7

- Design: FindTableForReservation(Timeslot t)
- Timeslot contains Date and time

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Reservation



Reservation



- 做法二：
 - 可以预定：直接进入Confirm阶段
 - 不能预定：Throw exception / Show message

- Design: Pair<Table, Timeslot> findTableForReservation(Time slot)
throws NotableForReservationException

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Reservation



Reservation



- 做法二：

- 可以预定：直接进入Confirm阶段
- 不能预定：Throw exception / Show message

The screenshot shows a reservation confirmation page. At the top, there's a header with the restaurant name 'Toscana Bistro Square'. Below it, a table shows the reservation details: '2 people', 'Date: Tue Oct 10, 2017', 'Time: 9:30 PM', and 'Restaurant: Toscana Bistro Square'. To the left of the table, there's a note: 'Want to book this table for you for 4-24 minutes?'. Below the table, there's a 'POINTS' section with a note: 'Not a member? Join OpenTable and receive 100 points upon dining.' At the bottom of the page, there are several checkboxes for special requests like 'Select an occasion (optional)', 'Add a special request (optional)', and 'Yes, I want to receive email messages from this restaurant and reminders about my reservations?'. A red button at the very bottom right says 'Complete Reservation'.

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- 为什么我们可以跳过List<Result>这个步骤？

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Reservation



Reservation



- 做法二：

- 可以预定：直接进入Confirm阶段
- 不能预定：Throw exception / Show message

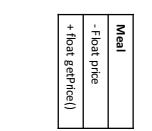
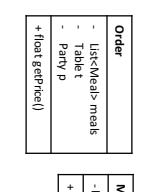
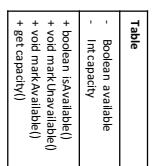
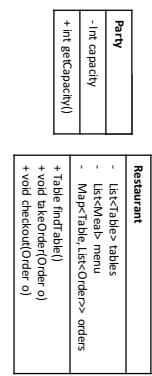
- Design: Pair<Table, Timeslot> findTableForReservation(Time slot)
throws NotableForReservationException
- Design: void confirmReservation(Pair<Table, Timeslot> reservation)

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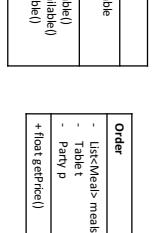
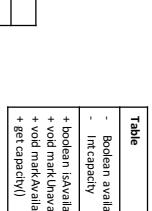
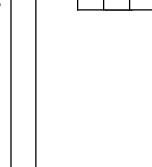
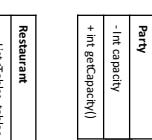
Restaurant



Restaurant



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Reservation

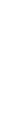
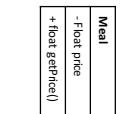
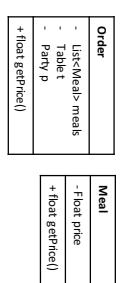
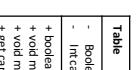
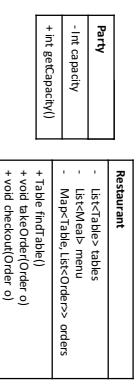


Reservation



- 为什么我们可以跳过List<Result>这个步骤？

因为Table是一样的，用户不用选择也不会知道是订1号桌还是2号桌



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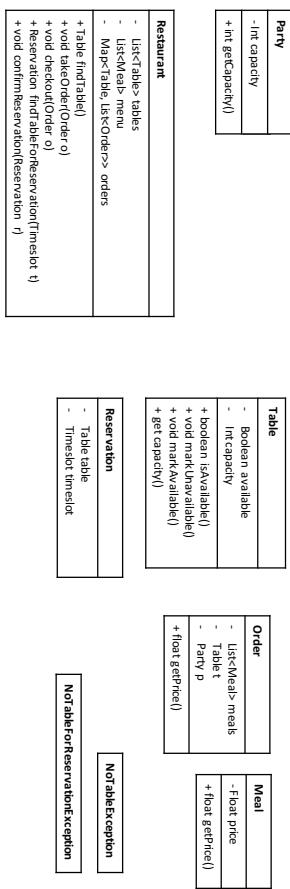
Restaurant



Any problems?



- How to know if a table is open for reservation for a timeslot?

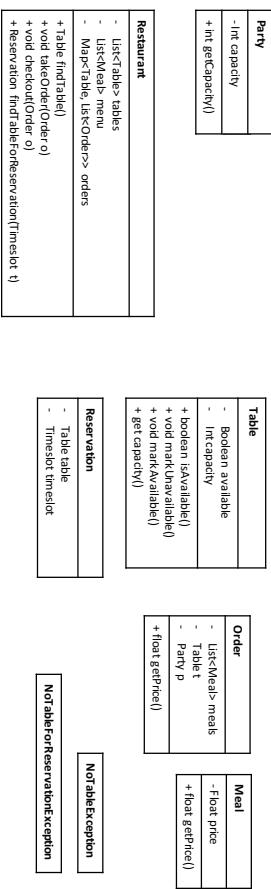


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Restaurant



Any problems?



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Any problems?



Any problems?



- How to know if a table is open for reservation for a timeslot?

```
if (Timeslot - MAX_DINETIME > CURRENT_TIME)
{
    if no reservation during Timeslot - MAX_DINETIME to Timeslot + MAX_DINETIME
        return true;
    else
        return false;
}
else
{
    return table.isAvailable();
}
```

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- 如何知道对于一张Table:

Any reservation during Timeslot - MAX_DINETIME to Timeslot + MAX_DINETIME?

Solution 1:
每张Table按时间排序保留一个list，对于每一个进来query的timeslot，都检查是否有符合上述区间的timeslot已经被预定了

```

}
else
{
    return table.isAvailable();
}
```

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Any problems?



Any problems?



- How to know if a table is open for reservation for a timeslot?

```
if (Timeslot - MAX_DINETIME > CURRENT_TIME)
{
    if no reservation during Timeslot - MAX_DINETIME to Timeslot + MAX_DINETIME
        return true;
    else
        return false;
}
else
{
    return table.isAvailable();
}
```

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- 如何知道对于一张Table:

Any reservation during Timeslot - MAX_DINETIME to Timeslot + MAX_DINETIME?

Any problems?



Solution 1 vs. Solution 2



- 如何知道对于—张Table:

- 分析各自的优缺点:

Any reservation during Timeslot – MAX_DINETIME to Timeslot + MAX_DINETIME ?

Solution 2:

保存一个Centralized的Map, 有被confirm过的timeslot就插入这个Map.
`Map<Timeslot, Set<Table>>`

当query一个新的timeslot的时候, 检查这个区间内已经被预定过的Table,
排除之后剩下的就是可选的桌子, 随意选一张即可

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Any problems?



Solution 1 vs. Solution 2



- 如何知道对于—张Table:

Any reservation during Timeslot – MAX_DINETIME to Timeslot + MAX_DINETIME ?

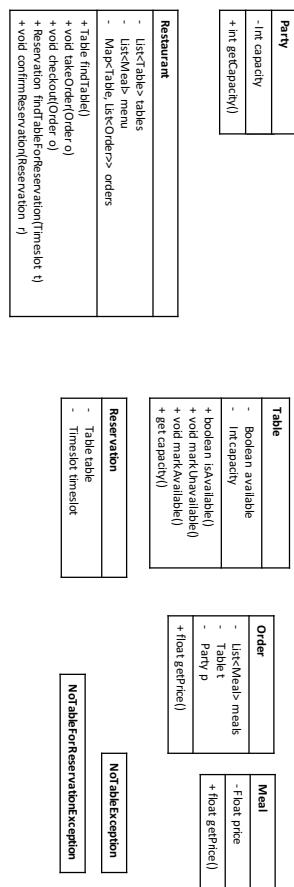
Solution 2:

保存一个Centralized的Map, 有被confirm过的timeslot就插入这个Map.
`Map<Timeslot, Set<Table>>`

当query一个新的timeslot的时候, 检查这个区间内已经被预定过的Table,
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Restaurant



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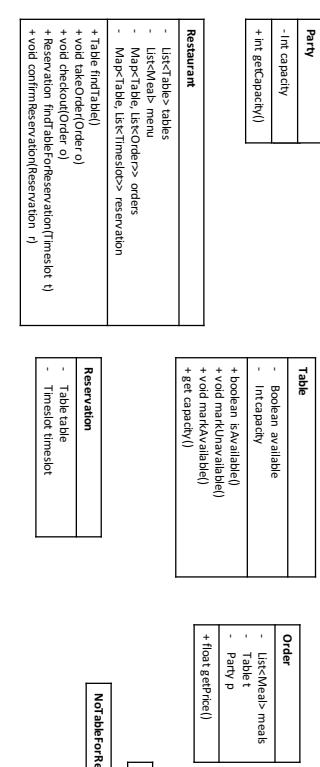
Solution 1 vs. Solution 2

- 分析各自的优缺点：

Solution 2: 如果Timeslot可以分得很细(每五分钟一个timeslot)
MAX_DINETIME假如为2小时，那么需要查24个entry



Restaurant

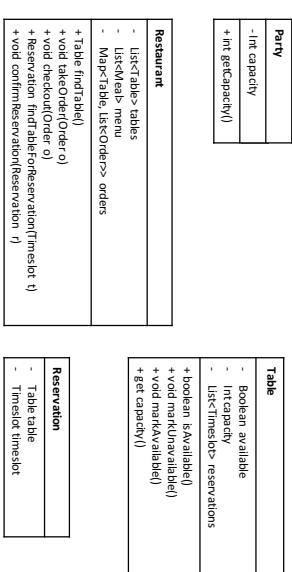


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Restaurant

- 1

```
+ int getCapacity()
```



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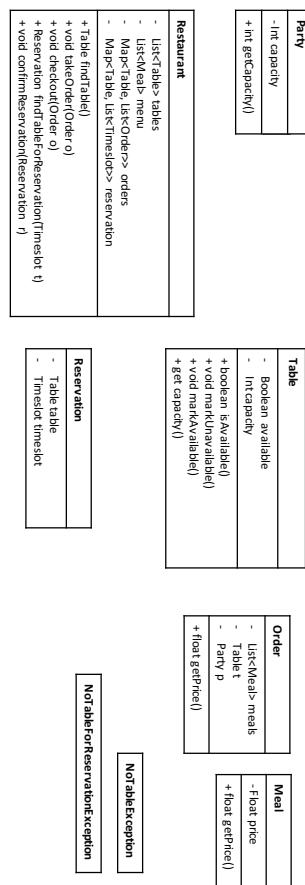
Restaurant



Hotel reservation system



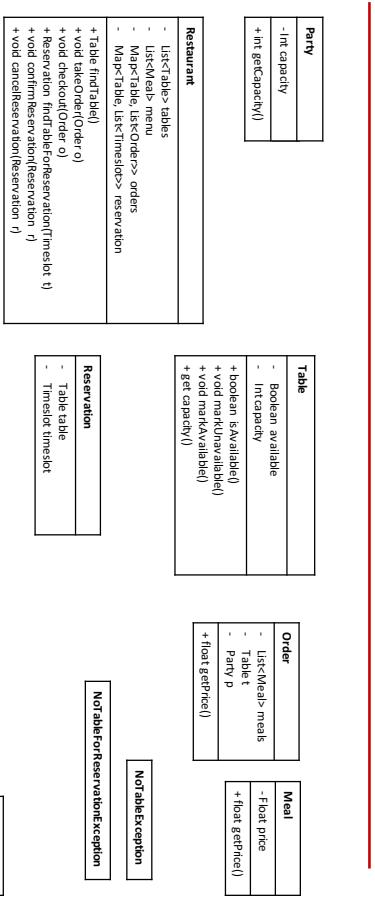
- Can you design a hotel reservation system?



Cancel reservation



- Restaurant takes a cancel reservation request, and ask the table to free that timeslot.



Restaurant



Clarify

- What

是为一间酒店设计预定房间系统，还是先选择酒店的系统？

Design上会有哪些区别？

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The screenshot shows a search interface for New York City. It includes fields for destination/property name, city (New York City), key word/term or brand, check-in (Friday November 17, 2017), check-out (Sunday November 19, 2017), room type (1 Room), adults (2 adults), children (0 children), and a search button. Below the search bar, there's a banner for 'Napa Shop' and a section titled 'Recommended for You' featuring 'Metropolitan Museum' and 'Grand Hyatt Hotel'. The main results area displays a list of properties, such as 'Grand Hyatt Hotel' and 'Metropolitan Museum', each with a thumbnail, name, address, rating, and price.

Hotel reservation system

- Can you design a hotel reservation system?

Clarify

- What

是为一间酒店设计预定房间系统，还是先选择酒店的系统？

- 搜索条件区别

人数 + 时间 VS. 人数 + 时间 + 地址

This screenshot shows a room selection screen for 'Grand Hyatt Hotel'. It lists room types: '超豪华大床房A' and '会员价 > 3990元起'. Below each room type is a red '预订' (Book) button. At the bottom, there are '全部' (All) and '筛选' (Filter) buttons.

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Clarify

- What

是为一间酒店设计预定房间系统，还是先选择酒店的系统？

- 返回结果区别

Rooms VS. Hotels

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Clarify

- What

是为一间酒店设计预定房间系统，还是先选择酒店的系统？

- 搜索条件区别

人数 + 时间 VS. 人数 + 时间 + 地址

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Clarify



Clarify



- What

Search criteria -> Search() -> List<Result> -> Select() -> Receipt

关键字： Room

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Clarify



Clarify



- What

是为一间酒店设计预定房间系统，还是先选择酒店的系统？

Search criteria -> Search() -> List<Result> -> Select() -> Receipt

- 针对本题：

除了考虑题目中的名词之外，还需要从上述的三处考虑，What类型的提问
主要针对List<Result>

先设计一间酒店，再设计选择酒店的系统

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Clarify

- What

针对本题：房间的人数和价格可能会不同

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Clarify

- What

关键字：Room

Room Type	Rooms	Room Price	Max Capacity	Book	Comment Your Reservation
Single Room	22	100	1	Book	1 person
Double Room	22	200	2	Book	2 people
Triple Room	22	300	3	Book	3 people
Four-Person Room	22	400	4	Book	4 people
Five-Person Room	22	500	5	Book	5 people
Six-Person Room	22	600	6	Book	6 people
Seven-Person Room	22	700	7	Book	7 people
Eight-Person Room	22	800	8	Book	8 people
Nine-Person Room	22	900	9	Book	9 people
Ten-Person Room	22	1000	10	Book	10 people

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Challenge

- 如何设计房间类？

Room
- int capacity
- float price

Challenge

Challenge

针对本题：房间的人数和价格可能会不同。

如何设计房间类？

Challenge

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Challenge



Challenge



如何设计房间类？

Room
- int capacity
- float price

List<Result> -> List<Room>

Room_1
Capacity : 2
Price: 198

Room_2
Capacity : 2
Price: 198

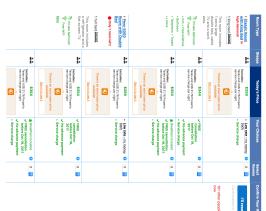
Room_3
Capacity : 2
Price: 198

Room_4
Capacity : 2
Price: 198

Room_5
Capacity : 1
Price: 128

Room_6
Capacity : 1
Price: 128

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How many room types do we have for this hotel?

针对本题：两种 (Single room 和 Double room)

Challenge



Challenge



Challenge



如何设计房间类？

Room
- int capacity
- float price

List<Result> -> List<Room>

How many room types do we have for this hotel?



Room_1
Capacity : 2
Price: 198

Room_2
Capacity : 2
Price: 198

Room_3
Capacity : 2
Price: 198

Room_4
Capacity : 2
Price: 198

Room_5
Capacity : 1
Price: 128

Room_6
Capacity : 1
Price: 128

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Challenge

九章算術

Clarify

九章算術

Restaurant VS. Hotel

- How

什么情况下需要考虑Result Type (Room Type)?

规则?

价格不同时

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Challenge

九章算術

Challenge

九章算術

Restaurant VS. Hotel

Restaurant VS. Hotel

什么情况下需要考虑Result Type (Room Type)?

价格不同时

单人间 VS. 双人间

头等舱 VS. 经济舱

大桌 VS. 小桌

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Clarify

- 当人数超过房间大小怎么办？

九章算法

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Core object

九章算法

Clarify



- 当人数超过房间大小怎么办？

Who & When

e.g. 3人住:

1. 列出所有组合的选择
 2. 由大到小自动分配

11A

DoubleRoom

... 20

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Clarify



- 当人数超过房间大小怎么办？

Who & When

e.g. 3人住:

1. 列出所有组合的选择
 2. 由大到小自动分配

11A

DoubleRoom

... 20

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Core object



Core object



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Core object



Core object

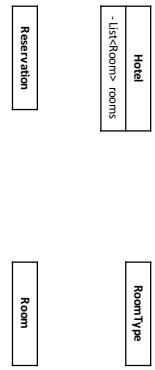


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Core object



Core object



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Core object



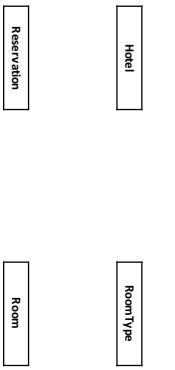
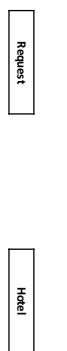
Core object



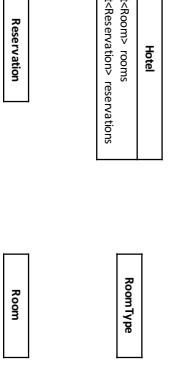
Core object



Core object



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Use cases



Use cases



Hotel

Hotel:

- Search for available rooms
- Make reservation

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Core object

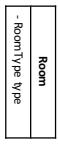
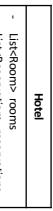


Use cases



Hotel:

- Search for available rooms



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Core object

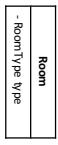
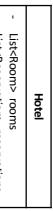


Use cases



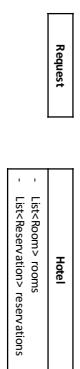
Hotel:

- Search for available rooms

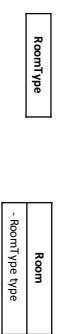


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Classes



Use cases



Search for available rooms
Cancel reservation

1: Based on search criteria



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Use cases



Hotel:

- Search for available rooms
- Make reservation
- Cancel reservation

Use cases



Search for available rooms

- 1: Based on search criteria
- 2: Go through rooms to check availability
- 3: List available room types and available count

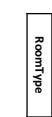
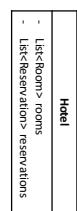
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Classes



Use cases



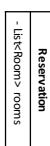
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Classes



Classes



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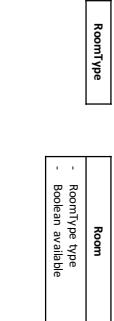
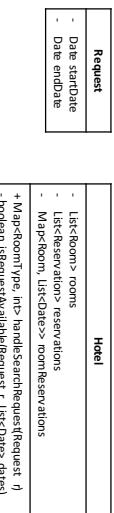
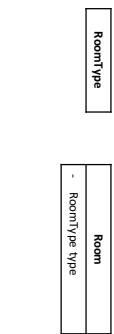
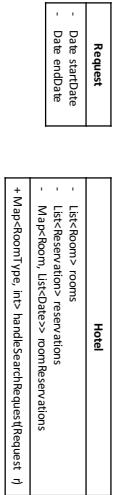
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2. Go through rooms to check availability

Search for available rooms

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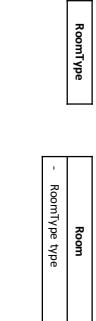
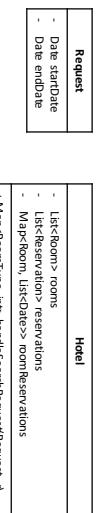
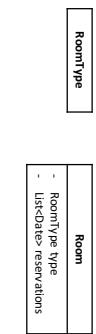
Classes



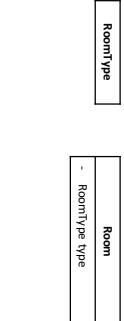
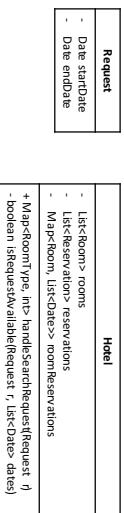
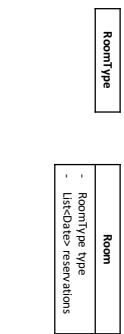
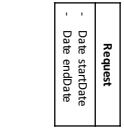
Classes



Classes



Classes



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Use cases



Classes



Search for available rooms

Request	Hotel
- Date startDate	List<Room> rooms
- Date endDate	List<Reservation> reservations
- Map<Room, List<Date>> roomReservations	Map<RoomType, int> handleSearchRequest(Request r, List<Date> dates)
+ boolean isRequestAvailable(Request r, List<Date> dates)	

Room
<<enumeration>>
- RoomType type
- Boolean available

Room
SINGLE
DOUBLE

3: list available room types and counts

Reservation
- List<Room> rooms

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Classes



Classes



Request
- Date startDate
- Date endDate

Hotel
- List<Room> rooms
- List<Reservation> reservations
- Map<Room, List<Date>> roomReservations

RoomType
- RoomType type
- Boolean available

Room
- RoomType type
- Boolean available

Request
- Date startDate
- Date endDate

Hotel
- List<Room> rooms
- List<Reservation> reservations
- Map<Room, List<Date>> roomReservations

RoomType

Room
- RoomType type
- Boolean available

Room
- RoomType type
- Boolean available

+ boolean isAvailable()

- boolean isRequestAvailable(Request r, List<Date> dates)

- boolean isAvailable(RoomType type, List<Date> dates)

- boolean isAvailable(Room room, List<Date> dates)

- boolean isAvailable(RoomType type, Room room, List<Date> dates)

Reservation

- List<Room> rooms

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Use cases
- SearchForAvailableRooms
- GetRoomTypes
- GetRoomCounts

- GetRoomCounts

- SearchForAvailableRooms

- GetRoomTypes

- GetRoomCounts

Use cases

Use cases

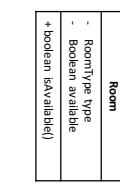
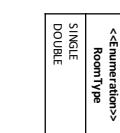
Make reservation

- 1: Add RoomType and number of rooms in a request
- 2: Send request to Hotel
- 3: If there is enough room left, confirm the reservation
- 4: If there isn't enough room left, throw exception

Classes

Classes

Make reservation



- 1: Add RoomType and number of rooms in a request
- 2: Send request to Hotel
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Use cases

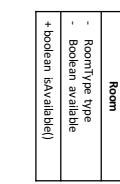
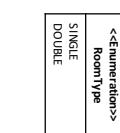
Use cases

Make reservation

Classes

Classes

Make reservation



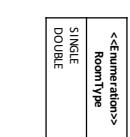
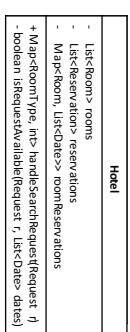
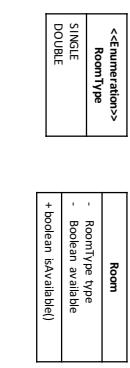
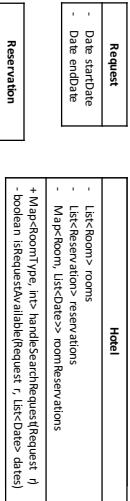
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- 4: If there isn't enough room left, throw exception

Use cases

Use cases

Make reservation

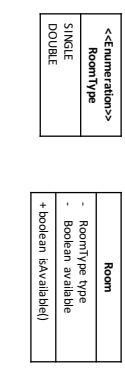
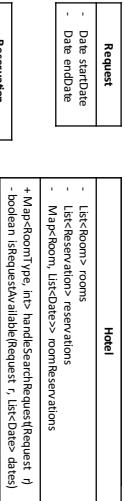
Classes



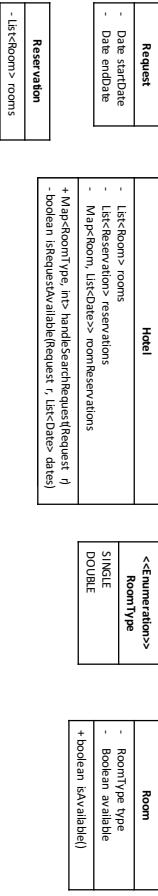
Classes



Classes



Use cases



Make reservation

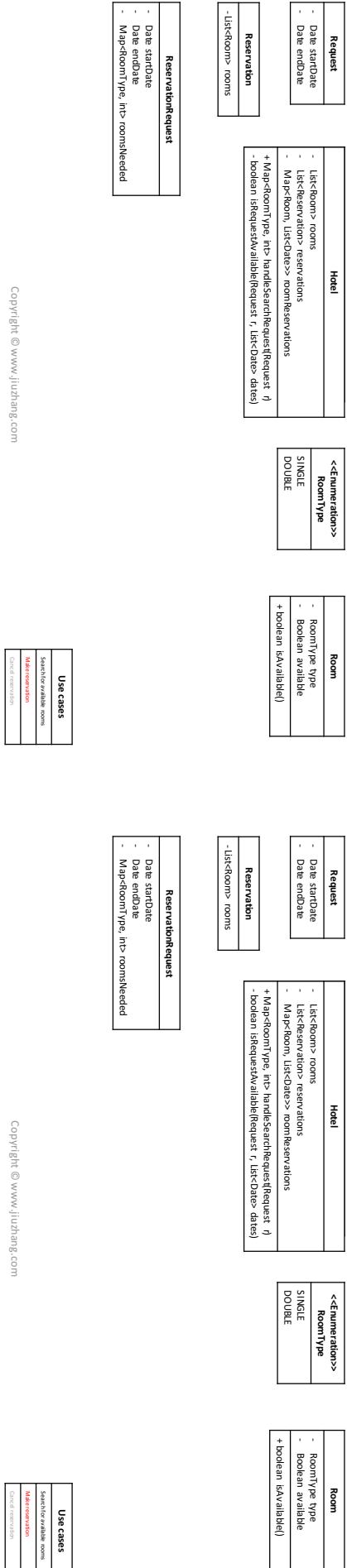
2: Send request to Hotel

ReservationRequest
-
Date startDate
-
Date endDate



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九章算法



Use cases



Use cases



Make reservation

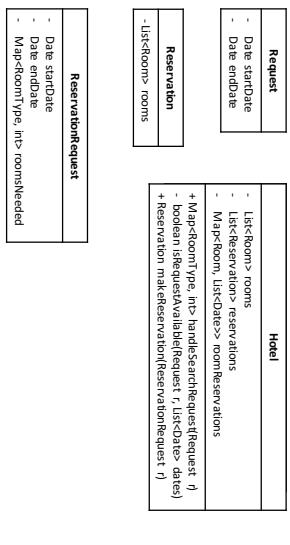
Make reservation

3: If there is enough room left, confirm the reservation

4: If there isn't enough room left, throw exception

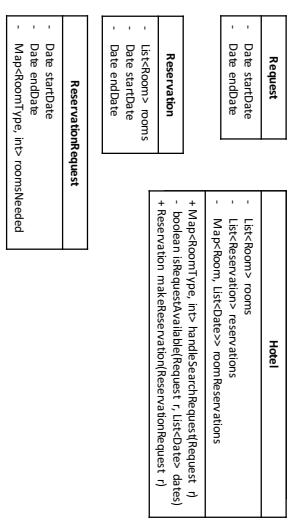
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Classes



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Challenge



Challenge



Search for available rooms

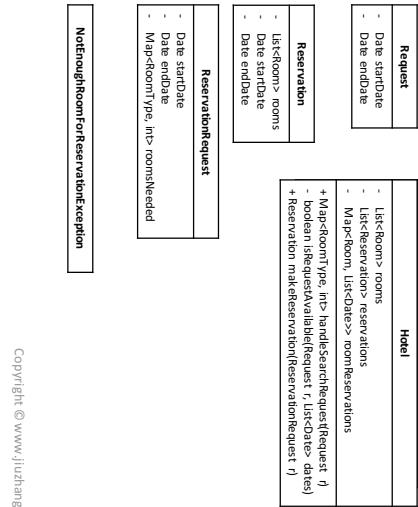
Make reservation

- 1: Based on search criteria
- 2: Go through rooms to check availability
- 3: list available room types and room count

- 1: Add RoomType and number of rooms in a request
- 2: Send request to Hotel
- 3: If there is enough room left, confirm the reservation
- 4: If there isn't enough room left, throw exception

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Classes



Challenge



```
Map<RoomType, List<Room>> map = new HashMap<>();  
for(Entry<Room, List<Date>> entry : roomReservations.entrySet())  
{  
    Room r = entry.getKey();  
    List<Date> roomBooked = entry.getValue();  
    if(!isRequestAvailable(roomBooked))  
    {  
        if(map.containsKey(r.getRoomType()))  
        {  
            List<Room> roomList = map.get(r.getRoomType());  
            roomList.add(r);  
            map.put(r.getRoomType(), roomList);  
        }  
        else  
        {  
            List<Room> roomList = new ArrayList<>();  
            roomList.add(r);  
            map.put(r.getRoomType(), roomList);  
        }  
    }  
}
```

NoEnoughRoomForReservationException

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Use cases

Select for available rooms

Make reservation

Date of reservation

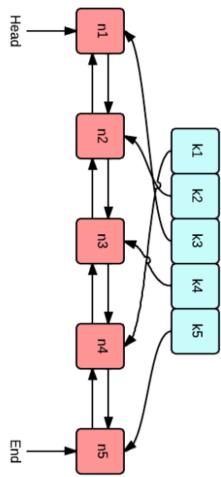
- Map<RoomType, List<Room>> map

- Go through rooms to check availability
- If there is enough room left, confirm the reservation
- If there isn't enough room left, throw exception

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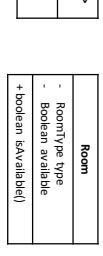
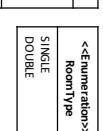
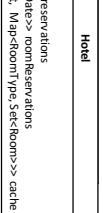
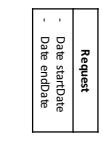
Challenge

- LRU Cache



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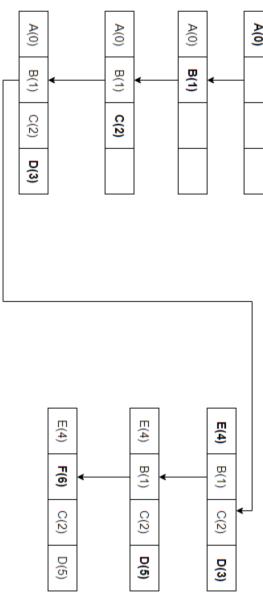


Challenge

Challenge

- LRU Cache

The access sequence for the below example is A B C D E F.

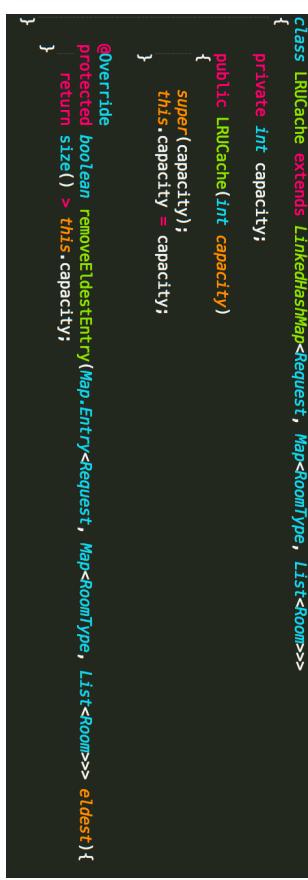


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Challenge

Challenge

The access sequence for the below example is A B C D E F.



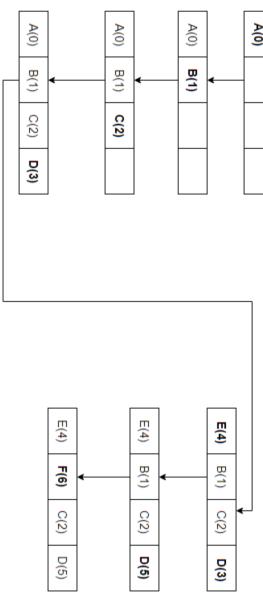
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Challenge

Challenge

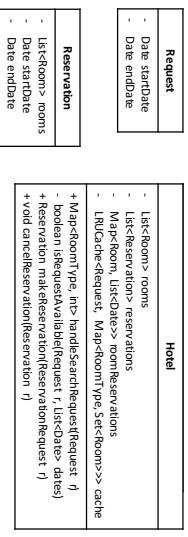
- LRU Cache

The access sequence for the below example is A B C D E F.

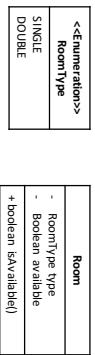


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Classes



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Challenge



面试官：

Can you extend your design to a booking.com like system?

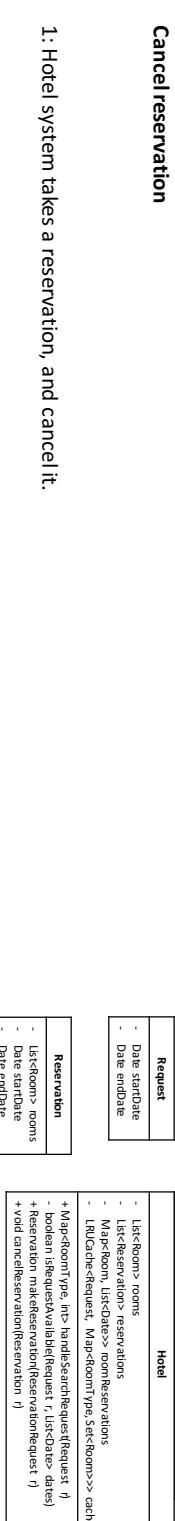
Classes



Use cases

Cancel reservation

1: Hotel system takes a reservation, and cancel it.



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Use cases

Cancel reservation

1: Hotel system takes a reservation, and cancel it.



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Use cases

Cancel reservation

1: Hotel system takes a reservation, and cancel it.



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Challenge



Challenge



Search criteria -> Search() -> List<Result> -> Select() -> Receipt

Search criteria -> Search() -> List<Result> -> Select() -> Receipt

Search criteria A -> Search() -> List<Result_A> -> Select() -> Search
criteria B -> Search() -> List<Result_B> -> Select() -> Receipt

Search criteria A -> Search() -> List<Result_A> -> Select() -> Search
criteria B -> Search() -> List<Result_B> -> Select() -> Receipt

Search criteria A : 10/30-11/5 Boston

BookingSystem.Search()

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Challenge



Challenge



Search criteria -> Search() -> List<Result> -> Select() -> Receipt

Search criteria -> Search() -> List<Result> -> Select() -> Receipt

Search criteria A -> Search() -> List<Result_A> -> Select() -> Search
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Challenge



Challenge



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Search criteria A -> Search() -> List<Result_A> -> Select() -> Search
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Search criteria A -> Search() -> List<Result_A> -> Select() -> Search
criteria B -> Search() -> List<Result_B> -> Select() -> Receipt

Search criteria A : 10/30-11/5 Boston

Search criteria B : 10/30-11/5

BookingSystem.Search()

BookingSystem.Search()

List<Result_A>: Hotel_1, Hotel_2,...

Hotel_1.Search()

BookingSystem.Select()

BookingSystem.Select()

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BookingSystem.Select()

BookingSystem.Select()

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Challenge



Challenge



Search criteria -> Search() -> List<Result> -> Select() -> Receipt

Search criteria -> Search() -> List<Result> -> Select() -> Receipt

Search criteria A -> Search() -> List<Result_A> -> Select() -> Search
criteria B -> Search() -> List<Result_B> -> Select() -> Receipt

Search criteria A -> Search() -> List<Result_A> -> Select() -> Search
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Search criteria A : 10/30-11/5 Boston

Search criteria B : 10/30-11/5

BookingSystem.Search()

BookingSystem.Search()

List<Result_A>: Hotel_1, Hotel_2,...

BookingSystem.Select()

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Challenge



Clarify



Search criteria A -> Search() -> List<Result> -> Select() -> Receipt

What

Search criteria A -> Search() -> List<Result_A> -> Select() -> Search
criteria B -> Search() -> List<Result_B> -> Select() -> Receipt

Search criteria A
List<Result_A>
Search criteria B
List<Result_B>
Receipt

Search criteria A : 10/30-11/5 Boston

Search criteria B : 10/30 -11/5

BookingSystem.Search()

Hotel_1.Search()

List<Result_A>: Hotel_1, Hotel_2,...

List<Result_A>: RoomType_1, ...

BookingSystem.Select()

BookingSystem.Select()

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Challenge



Clarify



Search criteria A -> Search() -> List<Result> -> Select() -> Receipt

What

Search criteria A -> Search() -> List<Result_A> -> Select() -> Search
criteria B -> Search() -> List<Result_B> -> Select() -> Receipt

Search criteria A
List<Result_A>
Search criteria B
List<Result_B>
Select
Receipt

Search criteria A : 10/30-11/5 Boston

Search criteria B : 10/30 -11/5

BookingSystem.Search()

Hotel_1.Search()

List<Result_A>: Hotel_1, Hotel_2,...

List<Result_A>: RoomType_1, ...

BookingSystem.Select()

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Clarify

需求
需求

Clarify

需求
需求

What

Q. Find Deals for Any Season

From cozy country homes to noisy city apartments.

Destination, property name or address:

More places than you could ever go but you can!

Check-in Fri 10/13

Check-out Sat 10/14

Are you traveling for work? Yes No

Babies: 1 Adults: 2 Children: 0

Search

How

Ashburn, VA

Fr 10/13

Sat 10/14

1 room

2 guests

+

+

Search()
Select()
Search()
Select()

What are the search criteria for booking system?

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Clarify

需求
需求

Clarify

What

针对本题：

用Start Date, End Date, Group size, City

需求
需求

Search criteria A
List<Result_A>
Search criteria B
List<Result_B>
Receipt

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Clarify



Core Object



How

On Top Pick Lowest Price First Sort ▾ Distance From Downtown Review Score

Recommended for You:



- 哪些Hotel可以被放进List里?
- 按照什么顺序排序?

针对本题：

- 在同样的City就能放进List里
- Hotel在List里的顺序不重要



Wyndham Boston Beacon Hill  
West End, Boston, MA - Show on map  12,880 feet from center
Swing Access
Located in Financial District of Boston, Wyndham Boston offers a fitness center and a bar. The hotel is just 100 meters from Financial Dist., too. Booked 2 times in the last 48 hours.

Excellent 8.7
73 reviews
Location 3.5
Show prices

Good 7.8
1,830 reviews
Location 3.5
Show prices

Booked 14 times in the last 24 hours

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Clarify



How



Clarify

How

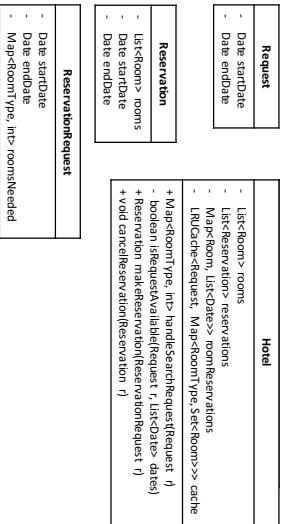
针对本题：

- 在同样的City就能放进List里
- Hotel在List里的顺序不重要

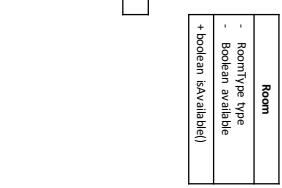
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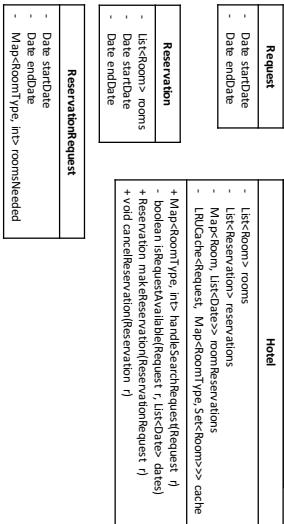
Core object



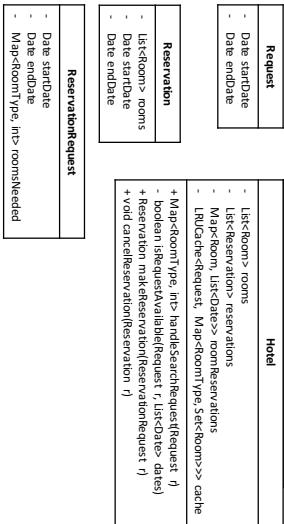
Core object



Core object



Core object



NotEnoughRoomForReservationException

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NotEnoughRoomForReservationException

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Use cases
Search for available rooms
Make reservation
Cancelling reservation

NotEnoughRoomForReservationException

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NotEnoughRoomForReservationException

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Use cases

Cancelled reservation

Use cases



Use cases



- BookingSystem

- Search for hotels

- Make reservation
- Cancel reservation

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Use cases



Use cases



- BookingSystem

- Search for hotels
- Make reservation
- Cancel reservation

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Classes

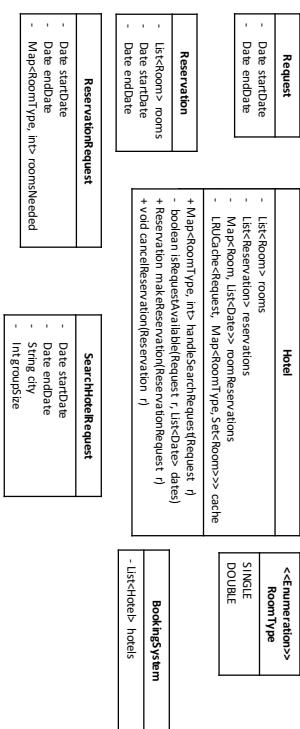


Class



- Search for hotels

- Based on request (start date + end date + city + group size)
- Check for all hotels in this city
- For such hotels, if this is enough capacity for group size during dates
- List all hotels that satisfy above criteria



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Class



Class

Classes

- Search for hotels



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Classes

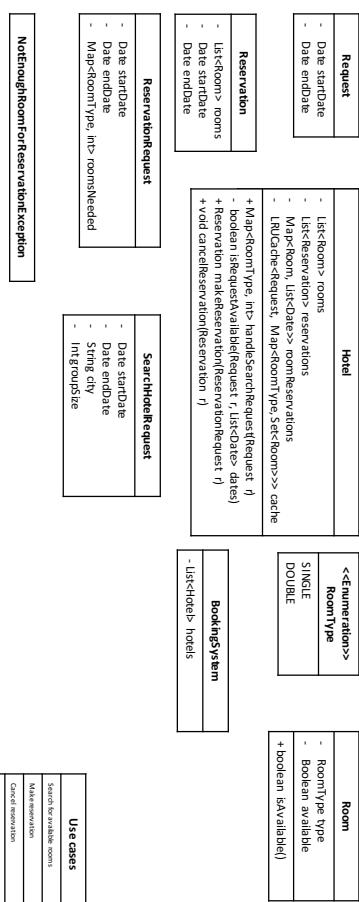


Class

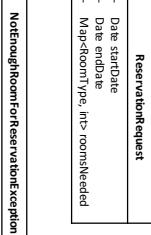


- Search for hotels

- Based on request (start date + end date + city + group size)
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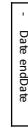


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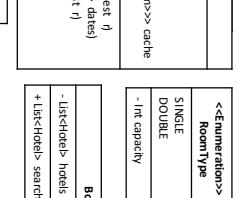
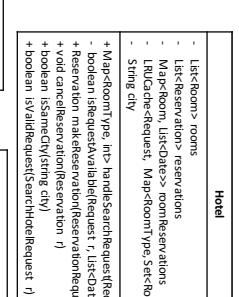
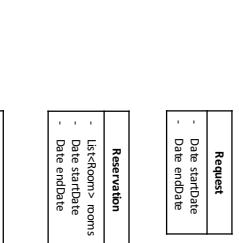
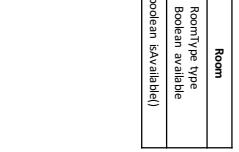
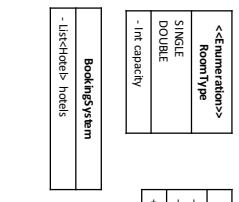
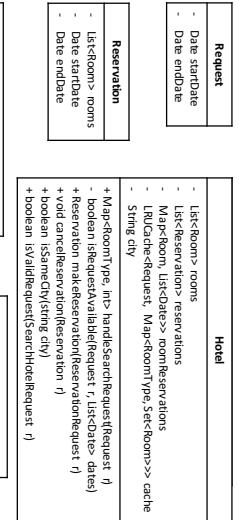
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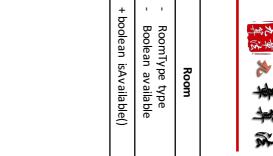
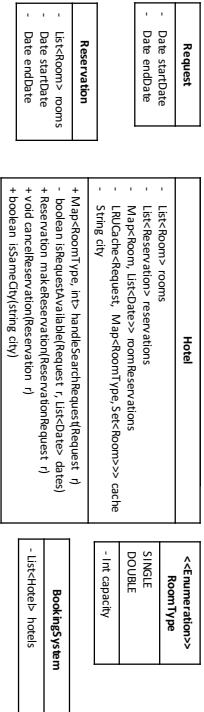
Classes



Class



Class



Classes

- Search for hotels

- Based on request (start date + end date + city + group size)
 - Check for all hotels in this city
 - For such hotels, if this is enough capacity for group size during dates
 - List all hotels that satisfy above criteria

ReservationRequest
<ul style="list-style-type: none"> Date startDate Date endDate Map<Room, type, int> roomsNeeded



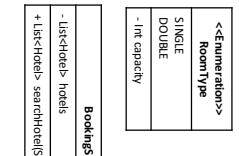
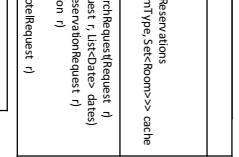
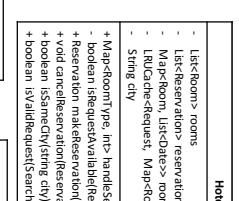
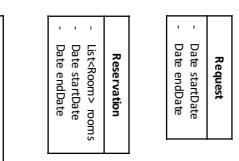
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Cancel reservation (Booking System)

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Cancel reservation (Booking System)

Class

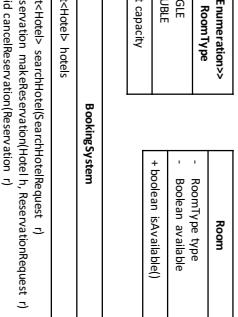
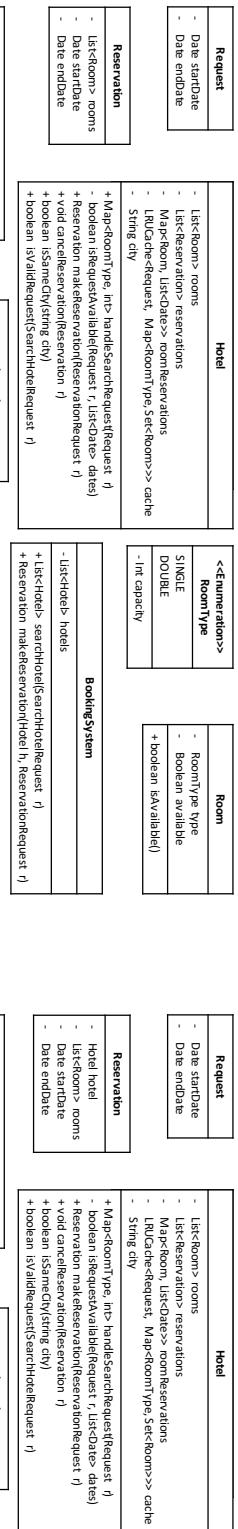


九章算法

Class



Class



Use case



Classes



- Make reservation
- Cancel reservation

- Pick a hotel
- Send reservation request to that hotel
- Cancel reservation for a hotel

Challenge



Challenge



- Can you add payment in your system?

- Need to get price for each reservation
- Can you add payment in your system?

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Class – Final view



Challenge



Request

- Date startDate
- Date endDate

Hotel

- List<Room> rooms
- List<Reservations> reservations
- Map<Room, List<Date>> roomReservations
- LRUCache<Request, Map<RoomType, Set<Room>>> cache
- String city
- + Map<RoomType, int> handleSearchRequest(Request r)
- Hotel hotel
- List<Room> rooms
- Date startDate
- Date endDate
- + boolean isRequestAvailable(Request r, List<Date> dates)
- + Reservation makeReservation(ReservationRequest r)
- + boolean isSameCity(string city)
- + boolean isValidRequest(SearchHotelRequest r)

ReservationRequest

- Date startDate
- Date endDate
- Map<RoomType, int> roomsNeeded

NoEnoughRoomsForReservationException

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Room

- RoomType type
- Boolean available
- + boolean isAvailable()

RoomType

- SINGLE
- DOUBLE
- Int capacity

Reservation

- List<Room> rooms
- + Reservation makeReservation(ReservationRequest r)
- + void cancelReservation(Reservation r)

SearchHotelRequest

- Date startDate
- Date endDate
- String city
- Int groupSize

Use cases

- Search for available rooms
- Make reservation
- Cancel reservation
- Search for hotels
- Make reservation (Booking System)
- Cancel reservation (Booking System)

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Enum code sample



Class



```

public enum RoomType
{
    SINGLE(1, 128),
    DOUBLE(2, 199);
}

private int capacity;
private float price;

RoomType(int capacity, float price)
{
    this.capacity = capacity;
    this.price = price;
}

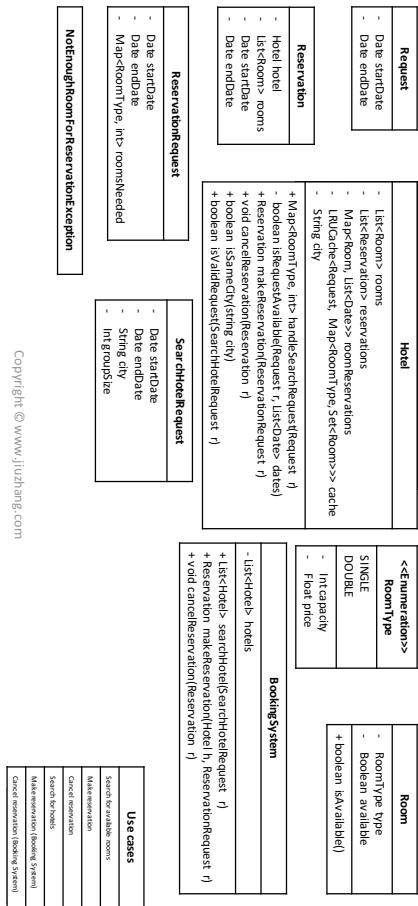
public int getCapacity()
{
    return capacity;
}

public float getPrice()
{
    return price;
}

```

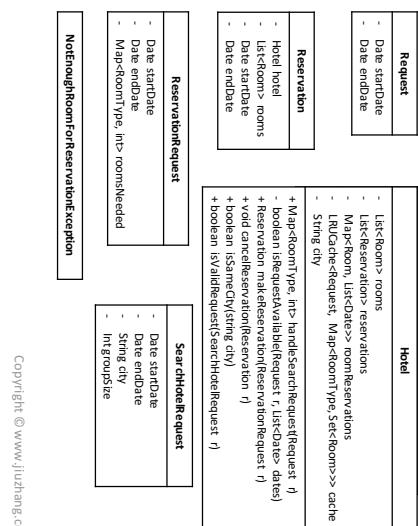
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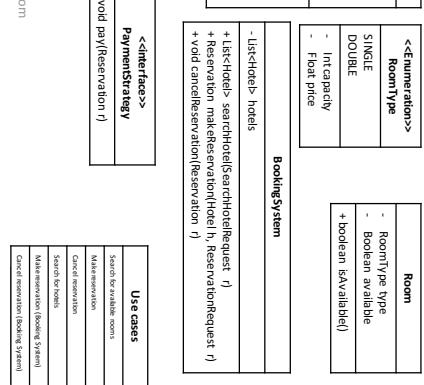
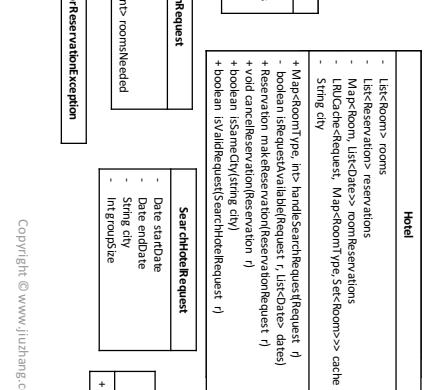
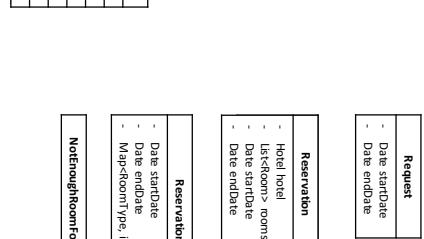
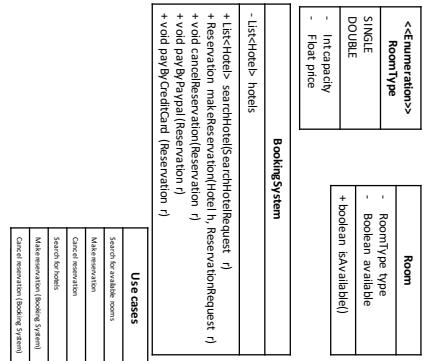
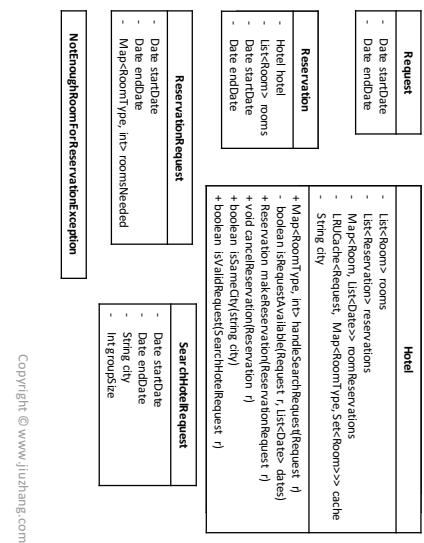


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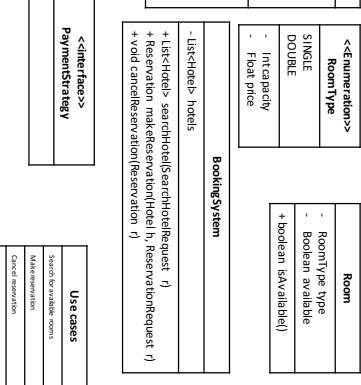
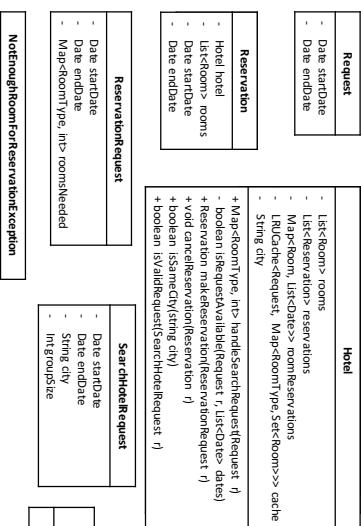
Good practice:



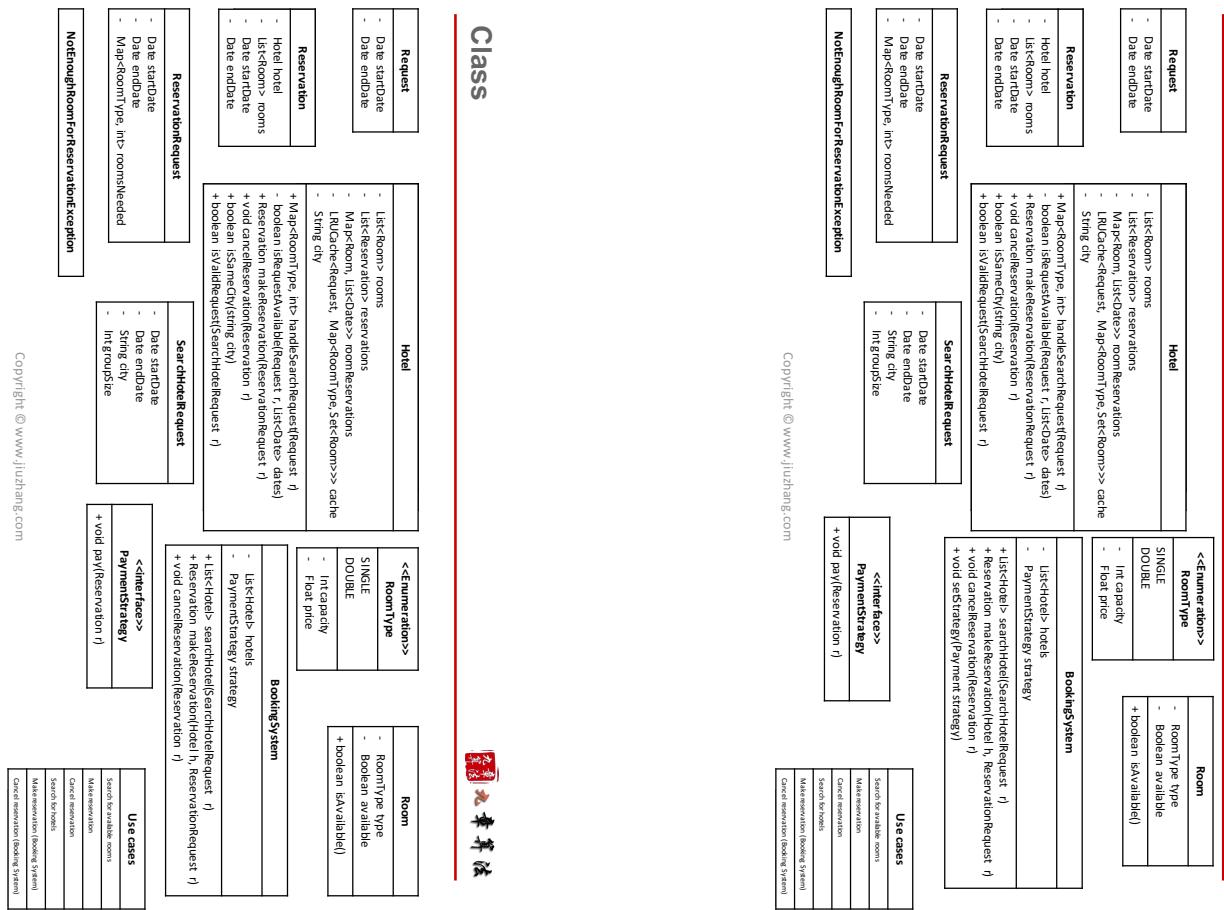
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- Strategy Pattern



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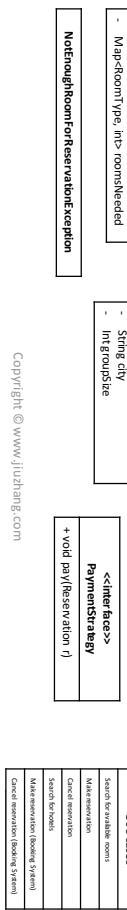


Q & A



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