GeekBand 极客班

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系统设计案例

大纲

音乐播放器
电梯调度设计
停车场设计
预定系统
日志track系统
分布式文件系统
部署系统
监控系统
访问控制系统
分布式统计聚合系统

音乐播放器

设计一个音乐播放器，能够管理专辑，播放歌曲

抽象

实体有播放器，专辑，歌曲，播放列表。
函数包括添加歌曲，删除歌曲，播放，停止，暂停

音乐播放器

设计对象

设计接口

创建一个播放列表可以如下定义:
ErrorResult createPlaylist(Vector<Song *> inSongsArray, Playlist *outPlaylist)

当ErrorResult为0时表示创建成功，outPlaylist指向该播放列表。

音乐播放器总结

- 可以依照抽象，设计对象，设计接口的流程进行思考
- 针对接口而不是实现来进行编程：不同对象之间保持接口一致，调用接口时不需要基于接口内的实现方式。

继承，组合，参数化

在面向对象中最常用的两种代码复用技术就是继承和组合。在设计对象的时候，“Is-A”表示一种继承关系

而“Has-A”表示一种从属关系，这就是组合

注意，多态是OOP相关的一个重要概念，也是面试常考的概念之一。在通常情况下，我们更偏向于“Has-A”的设计模式。因为该模式减少了两个实例之间的相关性。

参数化类型，或者说模版类也是一种有效的代码复用技术。

总结

- 对象组合技术允许你在运行时刻改变被组合的行为，但是它存在间接性，相对来说比较低效。
- 继承允许你提供操作的缺省实现，通过子类来重定义这些操作，但是不能够在运行时改变。
- 参数化允许你改变所使用的类型，同样不能够在运行时改变。

停车场

Design a parking lot using object-oriented principles.

使用抽象->设计对象->设计接口的流程。

设计流程

抽象
车库的主要功能在于实现车辆入库和车辆出库，根据汽车在车库中停留的时间收费

设计对象
车位，层次，车库，汽车这些实体。

设计接口
车库需要与用户进行交互，因此应该提供车辆入库和车辆出库的接口。

参考代码

design/partking_lot.cpp

进一步思考:
线程安全?
快速查找?

电梯调度设计

Design an elevator bank for a building, with multiple elevators

抽象
电梯间拥有多部电梯，当有用户需要乘坐电梯时，电梯间分配一个最优的电梯去用户所需的楼层。

电梯设计

设计对象

实体：电梯间和电梯

1) 当电梯处于停止状态，距离分等于当前楼层和需求楼层的差
2) 当电梯处于上升状态，如果需求楼层高于当前楼层，则距离分等于当前楼层和需求楼层的差， 否则不考虑当前电梯
3) 当电梯处于下降状态，如果需求楼层低于当前楼层，则距离分等于当前楼层和需求楼层的差， 否则不考虑当前电梯
4) 算法开始时先随机选择一部电梯，当存在更好的电梯选择时，替代当前的候选电梯，这样确保至少会有一部电梯响应

电梯设计

设计接口

多线程

预订系统

The standard question is about a restaurant reservation system, but one could also easily ask the same question regarding a car rental company or white-water rafting company or whatever. Something like:

I'm the owner of a restaurant and have been doing pen & paper reservations up to this point. I've hired you as a software consultant to design and implement a computer-based reservation system. I'm not worried about the user interface but rather the core objects and methods required to make this work. Some of my primary use cases include:

- When a customer calls up asking to make a reservation Saturday at 8pm for 4 people, the system needs to be able to check availability and then make the reservation if requested
- When a customer shows up at my restaurant at 8pm on Saturday, I need to be able to retrieve/confirm the reservation

Design a logging system

A common task for a developer when debugging is to log into machines and view log files looking for errors and potential causes.

Delayed Scheduling Problem

implement the following interface that executes a given task at a specified future time:

```
public interface DelayedScheduler {
   void delayedRun(long timeToRun, Runnable task)
}
```

Design a high performance distributed file system

The goal here is to design a high performance distributed file system: it should work on commodity hardware, connected over ethernet, and should not perform much worse than a local system.

Failure detector

Suppose you have a disk oriented system e.g., a database or a file system. The system is partitioned and replicated, there are many different nodes. Nodes are running on commodity hardware, talking over ethernet. The system is meant to guarantee low average latency (<5ms) and should be robust and fault tolerant.

Distributed Statistics Aggregation System

implementing a system that will collect and aggregate statistics from multiple systems us be used for plotting monitoring graphs or triggering alerts.

Top N exceptions

Imagine a service running on several hundred machines. It would be very useful to be able to be able to answer questions like 'In the last 24 hours, what N exceptions have occurred most often?'. Describe the system you would need to implement to provide data like that.

Spell Check

Consider a word processor that highlights spelling errors as a user types, highlighting a word as soon as the user enters a string of characters that cannot be a valid word. Describe the system that you would need in order to provide that functionality

Document Repository

Design an indexing system for a large repository of documents. Essentially, you have a staggeringly large collection of documents, and want to be able to answer questions like 'what documents have the words red and green, but not blue' in a reasonable amount of time. How do you compute and store indexes on words that you want to store?

Presentation Remote Control

Design a system for remote viewing of presentations via Web application (just learned there is a startup doing similar thing, http://presefy.com/). It is important to stress that there should be no additional downloadable components like WebEx or GotoMeeting. To make understanding easy you can say that there is a conference

Design a monitoring system

We have hundreds of Java applications running on thousands of servers. To ensure the applications are healthy and to allow us to quickly know of any issues, we need to have a monitoring and alerting system.

Others

Design a deployment system

Suppose we have a few Java applications right now, but will be expanding to hundreds. Our current deployment system won't scale as we are manually performing the deployment.
Can you design a deployment system that will allow developers to easily deploy their applications to production that scales to hundreds of applications?

Distributed Stream Processing

Concurrent circular buffer with index

Design a ACL system

Describe the need for engineering teams to 'take ownership' of sections of code in source control systems. How do we facilitate this?

Visit Site

What happens after you typed a URL in your browser and pressed return key?