Google 系统设计真题 2020

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拿谷歌 offer 必备课程

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Google 系统设计真题

1. 设计推特，获得给定用户最新发布的十条推特，按照发布时间从最近的到之前排序

2. 设计一个 auto complete 系统(type ahead 系统)

3. Design an URL Shortner. 比如服务器返回一个 200 length 的 URL 你的功能要把它 short 到 越短越好，还要保证唯一。这样前端人家拿到 url 不论是谁都可以访问那个很长的 URL... 从算法和网络两方面描述下你打算怎么做？

4. 设计一个 service 来 block 在黑名单里面的 url 访问。

5. 升级在火星的 data center 的操作系统

2.设计一个不需要后端 service 的页面访问权限验证。比如 google doc，用户 A 设定分享给 B, C, D。隔天想想不对把 D 移出分享清单。此时第一天 B, C, D 都要能访问这份 doc，第二天 只有 B, C 能访问

3.20 mins for various technical questions like SQL VS No SQL

4.20 mins for designing Satellite imaging system for Google maps

5.Firefox - design a system that will show the page "this site is blocked" on entering a blocked site.

6.Design Instagram:
upload pictures view/download pictures share pictures

7.design distributed cache

8.请自行设计记录数据点的数据结构。返回所有记录点遍历完成后的数组

9.Design a live broadcasting system like Twitch with the following functionalities:
a.Live video stream
Display total online users in the room (prompted me to talk about multiple different implementation & tradeoff)
b.Send gifts to room owner with a message broadcasted to all users in the room (assume multiple gifts & msg can appear on the same screen at once, how to make sure they are in order)
c.Room chat function
Playback video function should display gifts, screen messages, & chat to be shown again. (after broadcast is offline)

10.Design the 2048 game. Given an 2D array with input based on up, down, left, right movement what would be the output after 1 iteration

11.**A tread mill controller** controls the hardware (motors and actuators) based on user inputs.
Assuming that the hardware controls (speed controls, inclination controls, start, stop, emergency stop, heart rate sensor) and exercise calculations (calories burnt, max heart rate based on user profile⋯) are provided as APIs, design the controller that supports the following
features

Configure user profile based on age, sex, height, weight.
Support pre-defined exercise programs(cardio, interval, performance)
a. For example a cardio program will contain speed 5, inclination 2 for 10 seconds + speed 10, inclination 5 for 10 seconds.
Support creation of custom programs
Support save / retrieve custom programs
Design for Safety:
a. During program, monitor patient heart rate through sensor and stop program

gracefully (not an ad-hoc kill) when the heart rate approaches max.
b. Have an emergency stop * this should be highly performant (highlight the design considerations for this)
Represent the design with appropriate views (static & dynamics views) and the above requirements mapped to different elements.

12.实现一个 log system，同一句话出现的频率不能超过每 10 秒一次。Follow-up 是怎么把不需要的 stale data 清除掉

13.设计 map reduce 系统处理大数据，各种 HA, checkpoint, heartbeat, communication, etc.

14.设计多人协同工作的 google doc

15.设计 google calendar。能设单次和 repeat 的 event 提醒。触发时所有 client 都能 alarm。时间尽可能精确

16.美国的 all way STOP 路口，各路口的车是一次走一辆。对一个有 N 条道路的 all way stop 交叉路口，设计一个数据结构来模拟车辆可以进入路口的顺序。

17.设计如何给 data center 里的机器打补丁

18.Design Google Docs Versioning System

You have to implement Google Docs's versioning feature.
A document can be rich (multimedia like Youtube videos, embedding spreadsheets from Google Sheets, etc) and you will need implement the versioning system which allows you to revert back to an older version of the doc.
Let say this is the current version tree of a document: 1-> 2-> 3-> 4-> 5 (now)
A user can revert back to version 3, make an edit, and the new edit will be counted as version 6.
It is not possible to edit past versions.

19.设计 Google 搜索建议

20.design a job schedule system 如果让你设计一个这样的系统，能跑任何程序，需要哪些东西，哪些 UI 给用户

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