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## Microsoft Interview Experience | Set 54 (For SDE)

- Difficulty Level :[Medium](#)
- Last Updated :22 Jun, 2015

### Round 1 (45 mins):

Tell me about yourself.

1. Given an array of strings with **R, G & B** as characters. **Sort** the array such that all R comes first, followed by Gs & followed by Bs. Do it in **O(n)** time complexity. (**Paper Code**)

For eg. array is:

**I/P: G G R B R B B G R B R**

**O/P: R R R R G G G B B B B**

**Hint:** Same problem as sorting strings of 0s, 1s & 2s.

Done using the same logic as that of sorting 0s, 1s & 2s in no time. Interviewer was happy. \*: ) happy

2. Can you do the same above program using **Singly Linked List (SLL)** & **Doubly Linked List (DLL)** in **O(n)** time complexity.

Done it using DLL comfortably.

But using SLL I got stuck as we've to keep track of PREV pointer every time. He wanted it to be done in a SINGLE PASS if possible. Was not able to do this for SLL.

### Round 2 (1.30 hrs):

Tell me about the projects you've worked on.

1. **Matrix Multiplication** of 2 matrices. Both of the matrices are **Distributed** across a cluster of nodes. And matrices are of huge size (**BigData**). How can you multiply these matrices efficiently. He wanted to know the approach only but not the actual code.

(He asked me this Distributed problem esp. as we've worked on **Apache Spark & Hadoop Distributed architecture** in my project. So he was very keen to check my knowledge in the Distributed & BigData domain.)

**Hint:** Think in terms of **MapReduce** jobs.

**My approach:** As we know that in matrix multiplication, ith row is multiplied with jth column, (i+1)th row is multiplied with (j+1)th column, & so on till (n-1)th row with (m-1)th column.

**Map** each ith row to jth column, (i+1)th row to (j+1)th column & so on till (n-1)th row to (m-1)th column.

The idea is to make **Keys as ROW** index & **Values as Column** index.

While doing the **Reduce** operation, Multiply the respective Rows & Columns using above Mapped Rows & Columns. Because generally in the Reduce operation of MapReduce jobs, Spark/Hadoop brings all of the mapped data into one Server to do the computation & stores the result. So in the Reduce operation, Spark/Hadoop will bring only the mapped Row & Column while doing the actual multiplication. We need NOT to bring all Rows & Columns data at once.

This was my approach. One can think of the other approach also & share their better approach too.

Laterally he asked me about MapReduce jobs in further details & asked me about Hadoop & Distributed architecture (NameNode, DataNode, etc.). Some questions on Scalability.

2. Given an **N-ary tree** with **thousands of nodes** in it. **Pair** (Join) the **Leaf nodes** which do **NOT SHARE** the common path. i.e. Two Leaves can be Paired only if they do NOT have **Intersecting path**.

For example,

```
\r\n      A\r\n    /  |  \\ \r\n   B   C   D\r\n  /    /  |  \\ \r\n E    F  G  H
```

**Leaf nodes:** E, F, G, H & D

**Possible Pairs in O/Ps:**

(E-F), (G-H) or

(E-G), (F-H) or

(E-H), (F-G) or

(E-D), (F-G) or

(E-D), (G-H) or

(E-D), (F-H) or

(D-H), (F-G) or

(D-G), (F-H) or

(D-F), (G-H)

**Note:** If we pair(join) say, **(E-F)** then we can NOT pair any of the **(D-G)** or **(D-H)** as they SHARE the COMMON path from A to C.

i.e. E-B-A-C-F > (E-F) pair

D-A-C-G > (D-G) pair

D-A-C-H > (D-H) pair

So the above case is **NOT** possible.

Also if there are **EVEN** number of Childs, then exactly n/2 pairs are possible. In case of **ODD** number of Childs, 1 of the Childs will be left **Unpaired**.

I\xe2\x80\x99ve told him using **BFS** as it traverses each Edge exactly **ONCE**. The idea was while doing BFS traversal, Pair Childs of a Visiting node if both of their Childs are Leaf nodes.  
If the Visiting node has only **ONE** Child (Left Child or Right Child only) then store this Child in the TEMPORARY array (Array of Pointers to the Childs).  
Once the BFS traversal ends, Pair the remaining Childs in the **TEMPORARY** array one by one.  
Again he was NOT satisfied as BFS works **LEVEL-WISE**. So he told me what if some of the nodes have **SKewed** sub-tree with thousands of nodes.  
I got stuck. \xf0\x9f\x99\x81

He told me to apply **Mathematical Induction**.  
If we can prove for the Base Case that at least **2K** Childs can be Paired. Then we pair & prove it for **2K+2, 2k+4, , , , , 2K+n** Childs too.  
I was Blank in MI concepts.  
Was **NOT** able to solve this problem. \xf0\x9f\x99\x81

He was so impressed \*:.) happy with my 1st problem\&#x2\x80\x99s approach using MapReduce. He was a little bit satisfied with the 2nd problem\&#x2\x80\x99s approach. So I\&#x2\x80\x99ve been forwarded to 3rd round.

**Lunch time.** Sooooooooo Good. Food was so good. Really liked it.

### Round 3 (50 mins):

He had quickly looked at my CV. Then he asked me to tell something about the projects that I\&#x2\x80\x99ve worked on & working on. As I\&#x2\x80\x99ve worked mostly on **Machine Learning & NLP** domain, he asked me few questions about **NLP**. How will you Scale your current project.

1. Given a sentence, Reverse it **Word-by-Word**.  
\&#x2\x80\x99For example,  
\&#x2\x80\x99I/P: \&#x2\x80\x9cMicrosoft Azure is one of the best Cloud solutions\&#x2\x80\x9d  
\&#x2\x80\x99O/P: \&#x2\x80\x9csolutions Cloud best the of one is Azure Microsoft\&#x2\x80\x9d

\&#x2\x80\x99So easy. Given on GFG. \xf0\x9f\x99\x82  
\&#x2\x80\x99Done it in no time.  
\&#x2\x80\x99He asked me do it in a **SINGLE PASS**. As the solution requires **2 PASSES** of the sentence. (1st for reversing each individual word & 2nd for reversing WHOLE sentence).  
\&#x2\x80\x99Got stuck. \xf0\x9f\x99\x81 Taken a long time to think about this. Couldn\&#x2\x80\x99t able to do this. Finally he asked me another question.

2. Detect a **Loop** in a **Singly Linked List**. \*:.) happy  
\&#x2\x80\x99Given the GFG approach. He was Happy.

3. **Remove** the Loop in above SLL.  
Again given the same GFG solution. \xf0\x9f\x99\x82

I\&#x2\x80\x99ve been told to wait for the 4th & Final round.

### Round 4 (Design Round):

What do you know about **Cloud Computing**.  
Do you know anything about **Microsoft Azure**.

Design a **WindowsBox** just like **DropBox** Cloud storage.

Provide all the services **IaaS, PaaS & SaaS** using **Service-Oriented Architecture (SOA)**.  
Have given very Low-level design. NOT up to his expectations. As I\&#x2\x80\x99ve NOT worked on Cloud Technology earlier. \xf0\x9f\x99\x81  
NOT able to perform well in this round. \xf0\x9f\x99\x81

**Advise:**  
\&#x2\x80\x99Prepare for the **Design questions & Scalability**.  
\&#x2\x80\x99One can go through this link: <https://www.quora.com/How-should-I-prepare-system-design-questions-for-Google-Facebook-Interview>  
\&#x2\x80\x99Watch out this video. Its very good.  
\&#x2\x80\x99They look for the basics of **Data Structures & Algorithms**. (esp. Linked Lists & Tree)

Lastly, GeeksForGeeks is the best source for all. GFG really helped me a lot in the preparation.

Thanks \xf0\x9f\x99\x82

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