Solution: Employee Free Time

Let's solve the Employee Free Time problem using the Merge Intervals pattern.

We'll cover the following

Statement

You're given a list containing the schedules of multiple employees. Each person's schedule is a list of non-overlapping intervals in a sorted order. An interval is specified with the start and end time, both being positive integers. Your task is to find the list of intervals representing the free time for all the employees.

Constraints:

- $1 \leq$ `schedule.length` , `schedule[i].length` ≤ 50
- $0 \leq$ `interval.start` < `interval.end` $\leq 10^8$, where `interval` is any interval in the list of schedules.

Solution

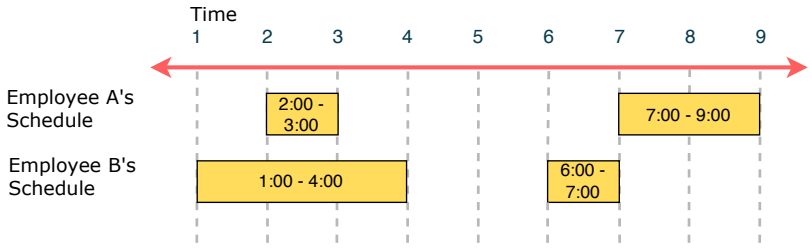
We find all common free time intervals by merging all of the intervals and finding out whether there are any gaps or intervals available between the time slots.

We use the following variables in our solution:

- `previous`: Stores the end time of the previously processed interval.
- `i`: Stores the employee's index value.
- `j`: Stores the interval's index of the employee, `i`.
- `result`: Stores the free time intervals.

The steps of the algorithm are given below:

- We store the start time of each employee's first interval along with its index value and a value `0` into a min-heap.
- We set `previous` to the start time of the first interval present in a heap.
- Then we iterate a loop until the heap is empty, and in each iteration, we do the following:
  - Pop an element from the min-heap and set `i` and `j` to the second and third values, respectively, from the popped value.
  - Select the interval from input located at `i,j`.
  - If the selected interval's start time is greater than `previous`, it means that the time from `previous` to the selected interval's start time is free. So, add this interval to the `result` array.
  - Now, update the `previous` as $max(previous, end\ time\ of\ selected\ \ interval)$.
  - If the current employee has any other interval, push it into the heap.
- After all the iterations, when the heap becomes empty, return the `result` array.



The given employees' schedule is presented in the following two-dimensional array.

Employee A	[2,3]	[7,9]
Employee B	[1,4]	[6,7]

Let’s look at the code for this solution below:

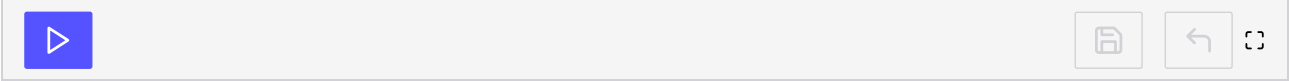
Java

main.java

interval.java

```java
import java.util.*;

class EmployeeFreeTime {

    public static List<Interval> employeeFreeTime(ArrayList<ArrayList<Interva
        PriorityQueue<int[]> heap = new PriorityQueue<>((a, b) -> a[0] - b[0]

        // Iterate for all employees' schedules
        // and add start of each schedule's first interval along with
        // its index value and a value 0.
        for (int i = 0; i < schedule.size(); i++) {
            List<Interval> employeeSchedule = schedule.get(i);
```

```java

        // Take an empty list to store results.
        List<Interval> result = new ArrayList<>();

        // Set 'previous' to the start time of the first interval in heap.
        int previous = schedule.get(heap.peek()[1]).get(heap.peek()[2]).getSt

        // Iterate until the heap is empty
        while (!heap.isEmpty()) {
            // Poll an element from the heap and get values of i and j
            int[] tuple = heap.poll();
            int i = tuple[1];
```



Employee Free Time

Time complexity

The time complexity of the solution is $O(n \cdot \log k)$, where k is the number of employees and n is the number of intervals. This is because the heap can contain a maximum of k elements.

Space complexity

We use a heap in the solution, which can have a maximum of k elements. Hence, the space complexity of this solution is $O(k)$, where k is the number of employees.

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Mark as Completed