Colby Wirth

COS 285

Assignment 4

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Analysis for Program 4 sub-tasks

File Input

The time complexity of the file input method has a worse case of $O(10n)$ as each line element has ten comma separated values which are all parsed one time. If a flight does not originate from the specified state, then only three of the ten elements will be parsed. This time complexity simplifies to $O(n)$.

Running QueueSimulator.simulation()

The *QueueSimulator.simulation*() function handles the logic for running a single simulation for a given amount of counters. It executes a for loop that adds passengers to a queue and subsequently processes the queue. The for loop executes $23n$ times where n is the number of days in the flightList - named 'aList' and 23 is the number of hours per day that a person can processed. It is assumed that all passengers arrive one hour before their flight, and no flight departs at 00:00 hours.

The simulation function has a for-loop that calls two additional function calls on each iteration: $addPassengers(ldt)$ and *processQueue*(). The first function $addPassengers(ldt)$ has a while loop that execute k times, where k is the number flights in aList who board at the same time for a given ldt. In the worst case $k = aList.size()$. The second function *processQueue*() has a while loop that execute while the queue from $addPassengers(ldt)$ is not empty, or until the amount of taken to process the passengers exceeds the limit. Worst case this executes k times. Thus the overall worst case time complexity for the simulation function is $O(2kn) \leftrightarrow O(n)$.

The function from the main class that runs each simulation is called *simRunner*(). This function will execute *QueueSimulator.simulation*() m times where m is minimum the number of counters required by an airport to process all passengers. This function occurs m times because the algorithm starts with 1 counter and iterates by 1 until the mth counter is found.

The overall time complexity of running a simulation for n days on one airport is $O(mn) \leftrightarrow O(n)$.