Software Design Document

Airport take-off time slot simulation in Python.

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10/26/2018

Introduction

Airport is a busy place with vast numbers of people passing through, which in turn requires efficient processes to make it seamless. Lots of resources are mobilized according to schedules to enable this.

We can build programs that can simulate the request and delivery of services at the airports based on the events happening at a predetermined rate. By simulating/generating requests for resources we can simulate the process of servicing those requests.

Purpose

Description of the Problem

As planes taxi and takeoff, they request resources (gates, ground operations) to enable them. The request for the resources must be managed according to priorities and safety requirements. When planes are getting ready to take-off they request access to taxi in preparation for take-off from the runway.

The program we build will tackle the problem of taxiing planes that request resources. There will be priority queues set up which will keep schedule of planes taking off. The program will receive a document listing all planes that made a request and request details. The queue will empty out per time requests and priority values.

Overview:

The application will work to schedule planes that submit request for take-off. They will inform the driver/controller the request details such as how long they need the runway for. It will assign take-off time in the day and will keep track of planes that take-off. We will have a print out of days take-off activity in order of takeoff

Implementation

- Read data from .txt file

- Create a priority Queue that will store data for takeoff request

- To read requests document and populate the queue

- Insert each request from file into the right place in the chain

- Print out the status of the queue as time moves along.

- print out a listing of the actual take off times of all planes

Ex. Input file could be from.txt file containing the various data fields: Output of our read may look like this

ID, Submission Time, Requested Start, Requested Duration
Delta 160, 0, 0, 4
UAL 120, 0, 5, 4
Delta 6, 2, 3, 6

Design

The program will be written in Python. The program will take in input from the user in the form of a text file (.txt) or comma separated value file (.csv). Program defines and uses classes and functions defined to simulate the schedule run.

We will have a regular list storing all the Request objects in order they are in the document. We will implement the queue by laying linked list structure on the list by modifying the next attribute of the *request*() objects in the list. This queue will have a *self.first*, *self.last*, and size attributes. And all elements will have next pointing at the item that is in next for dequeue.

The time simulator will use counter to simulate turning of time. It will dequeue items that are due for takeoff until last.next == 0(representing end of list) has taken off.

We will get a report of takeoff activity summary for the day at the end of the simulation.

Classes

- Request.py
- Priority_Queue.py
    -Priority Queue
-Airport Driver.py

The following command is needed to run the program

```
Python Main.py Scheduling.txt(the input file)
```

Classes and diagrams

Request
self.__flight_ID = name self.__req_duration = reqduration self.__actual_start = 0 self.__actual_end = 0 self.__submission_time = subtime self.__req_start = reqstart self.next = None self.prev = None
showFlightInfo(self): get_submissionTime(self): get_reqStart(self): get_actualStart(self): get_flightID(self): get_actualEnd(self): get_reqDuration(self): set_actualStart(self, start): set_actualEnd(self, end):

Priority_Queue
self.Queue = [] self.first = 0 self.last = 0 self.length = len(self.Queue)
def enqueue(self, new_item) def dequeue(self, item_index) def empty(self)

Airport_Driver.py

- ➔ This class is meant to be where all calls to functions are done from.
- ➔ Will read in file passed as parameter.
- ➔ Will also send data items as attributes to build the request objects

Airport_Driver

def __init__(self, file_name):
  self.ScheduleList = []
  self.input_list = []
  self.__file_name = file_name
  self.current_queue = Priority_Queue.Priority_Queue()
  self.input_list = []

def display_contents(CurrentList) def Simulator(self): def process_input(self) def __sort_by_priority(self, input_list) def set_takeoff_time(input_list)