

# Elevator Assignment

There are 4 elevators available to take passengers up and down the floors of a 100 floor building. Each elevator can be **STOPPED**, **STOPPING**, **MOVING\_UP**, or **MOVING\_DOWN**. It takes an elevator 2 seconds of STOPPING to be STOPPED. It currently takes each elevator 10 seconds of moving to move between each floor. There is a maximum of 8 passengers allowed in a single elevator.

Building passengers are complaining about the length of time they have to wait for elevators and the time it takes for them to get to their destination.

Implement an Object Oriented simulation, based on the set of Start Time(s) in seconds, Start Floor, and End Floor from Data\_file\_M10.csv, and determine the average wait time and the average travel time it takes for passengers.

A passenger arrives at the Start Floor at the Start Time, waits for the elevator to arrive and stays on the elevator until arriving at the End Floor. When a elevator arrives at a floor, it picks up all of the passengers waiting at the floor, up to the maximum capacity of 8, and then starts moving to the End Floors.

The objects should be as a minimum

- the Elevators,
- the Passengers,
- and Floors,

each with attributes and behaviors as well as relations to other objects. Passengers should be queued waiting, if necessary, for elevators. The simulation performs one loop each [simulated] second. Every loop each object decides what to do. If STOPPED and current time is equal to or greater than the next Start time, it

either begins MOVING\_UP or MOVING\_DOWN depending on the direction needed to pick up the passenger. If MOVING\_UP or MOVING\_DOWN and there are one or more passengers waiting at a floor along the way or current passengers with End Floor being the current floor, it begins STOPPING. When STOPPED at a floor if there are any passengers in the elevator with that End Floor as a destination it discharges the passengers. Then, if there are any passengers with that floor as their Start Floor it picks up passengers up to the capacity of the elevator. Only one elevator can pick up a passenger. There is no central controller of elevators as each elevator is making its own decisions as to which passengers to pick up and discharge, therefore there are no conflicts. As this is merely a simulation, the logic can be extremely simple and maybe inefficient, but all passengers should be picked up and arrive at destinations. Wherever possible, data structures should be STL.

A contractor has proposed, for \$50,000, to speed up the elevators from 10 seconds to 5 seconds between each floor. Rerun the simulation with a time between each floor of 5 seconds, to determine the % reduction of average wait time and the % reduction of average travel time for passengers that could be achieved.