

Assessment.

You are a Junior software engineer at an important software and cloud storing company.

Your company specializes in the IoT industry, storing data from your client's devices which vary from temperature sensors for houses up to specialized meteorological stations for weather forecasting.

One of your main clients is the owner of a water treatment company. He wants you to help him create a new custom platform which would be able to not only send information about the performance of one of his water treatment facilities to the IoT cloud servers but also store the information locally and generate automatic daily reports on the acquired data.

Your client's parameters are the following:

1. The platform will take information from 5 different sensors in charge of measuring:
 - a. Water level on the storing tanks. (1)
 - b. Turbidity of the incoming water. (1)
 - c. Amount of available chemicals (chlorine, flocculant, and coagulant). (3)
2. The daily report should present the following information:
 - a. Amount of used chemicals and their approximate cost.
 - b. Average, minimum and maximum storing tanks levels.
 - c. Average, minimum and maximum turbidity of the incoming water.
 - d. Alerts of low amounts of available chemicals.
 - e. Comparison of items a, b and c with the previous three days.

Your client asks you to create a simulation of the water treatment facility to evaluate how the system would work.

Important information:

- The coagulant and flocculant used in this facility corresponds to aluminum sulfate and limestone, respectively. The coagulant is used with a concentration of 25mg per liter of water and the flocculant of 15mg per liter of water. For the chlorine 0.05ml are used per liter of water.
- The amount of chemicals is considered low when there is less than 1 day of chemicals left. A total of 10kg of coagulant, 8Kg flocculant and 20 liters of chlorine can be stored.
- The capacity of the storing tanks is 200.000 liters.
- The demand of water varies between 0.2 and 2l/s throughout the day and the facility's water plant starts working when the tanks capacity is below 70% and stops if they reach 95% capacity. The plant can treat 1.2l/s.
- In case the water storing tanks' capacity goes below 15% the facility limits its output to a maximum of 0.6l/s until they reach 60% capacity level.

Considerations for the simulation:

- The simulation will be developed on python.
- The starting values for tanks and chemicals capacity will be 100%.
- The time can be escalated as pleased (e.g. 1 real time hour = 20 simulation seconds), but still all the data should be generated and locally saved on a local database.
 - The selection of the local DB has no restrictions, but the reason for selecting it should be stated and explained.
- The simulation should run for “15 days”
- The turbidity will be randomly generated and should be between 250 and 800 NTU.
 - Values higher than 780NTU should create an alert on the daily report.
 - The value of turbidity should be changed every “10 minutes”.
- Water demand will also be randomly generated between the specified values.
 - The value of demand should be changed “hourly”.
 - When the facility is on limit mode (tanks’ capacity goes under 15%) the demand should change randomly between the minimum and maximum established limits.
- The information of the sensors should be taken every “minute”. (If 1hour = 20seconds then 1min = 0.3seconds which means taking the information from the 5 sensors every 0.3seconds)
- Once the chemicals reach low levels they will be re-filled to 100% the next day.
- Since the time of the simulation will be escalated the information should be uploaded to the IoT cloud platform every “hour” (If 1hour = 20seconds then the information should be updated to the platform every 20 seconds)
 - The IoT platform selection has no restriction but should also be explained.

Considerations for the presentation:

- Prepare a 15-minute-long presentation about the assessment.
- Explain the DB and IoT cloud platform selection.
- Present important and clear information.
- Remember to present as if you were the Junior software engineer.
- The presentation can be performed in either English or Spanish.