Scan of Agricultural fields by Drones

Project presentation – RSA

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Objectives

- Develop a system where drones go to a certain area of the agricultural field to check if the field needs to be irrigated or not:
  - ❑ CAMs are sent periodically with information on the successive updated positions of each drone during the simulation.

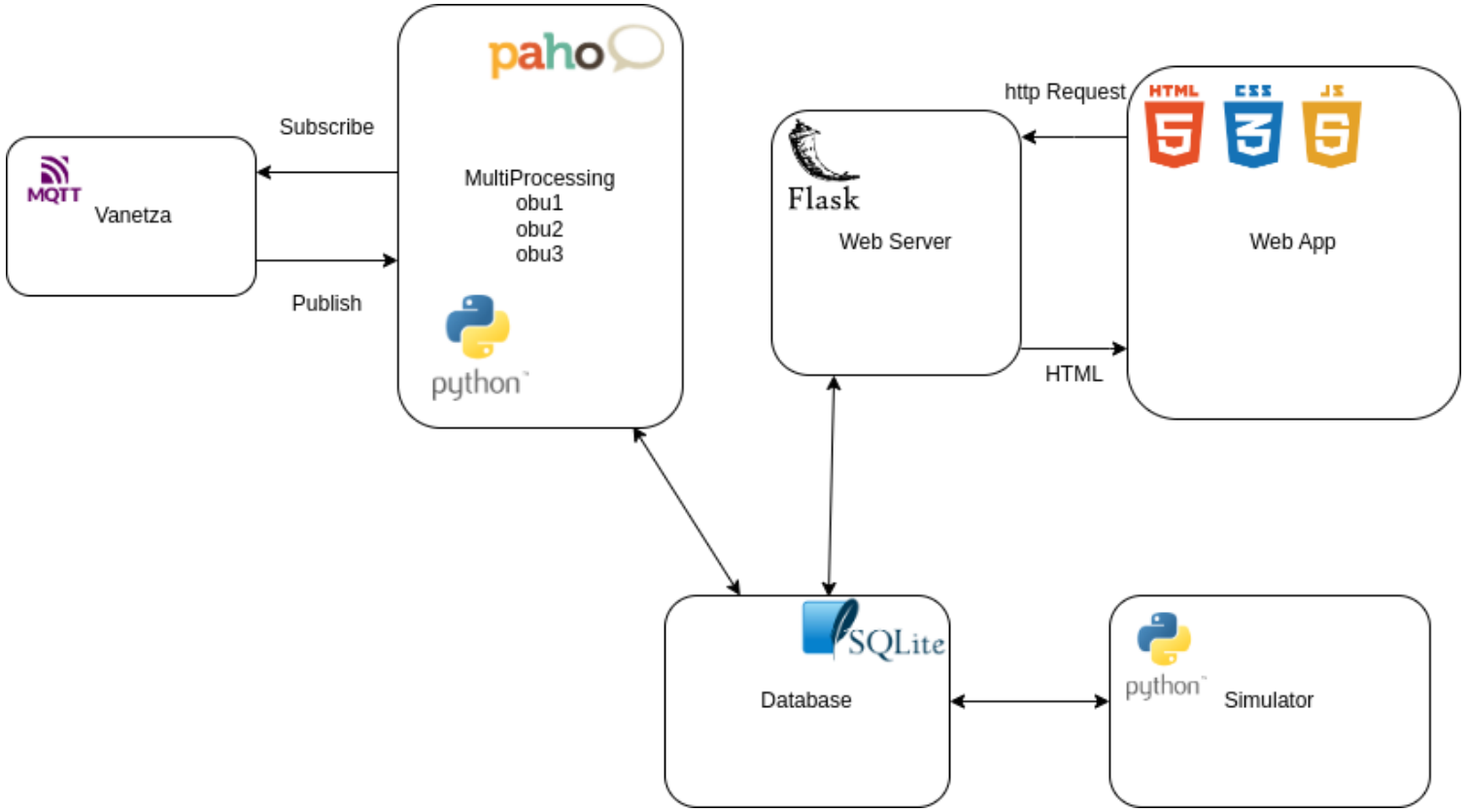
- After analyzing the area of the agricultural field, each drone sends DENM with the information it obtained from the captured images of the field:
  - ❑ CauseCode = 1, means the field needs to be watered.
  - ❑ CauseCode = 0, means the field does not need to be watered.

Messages

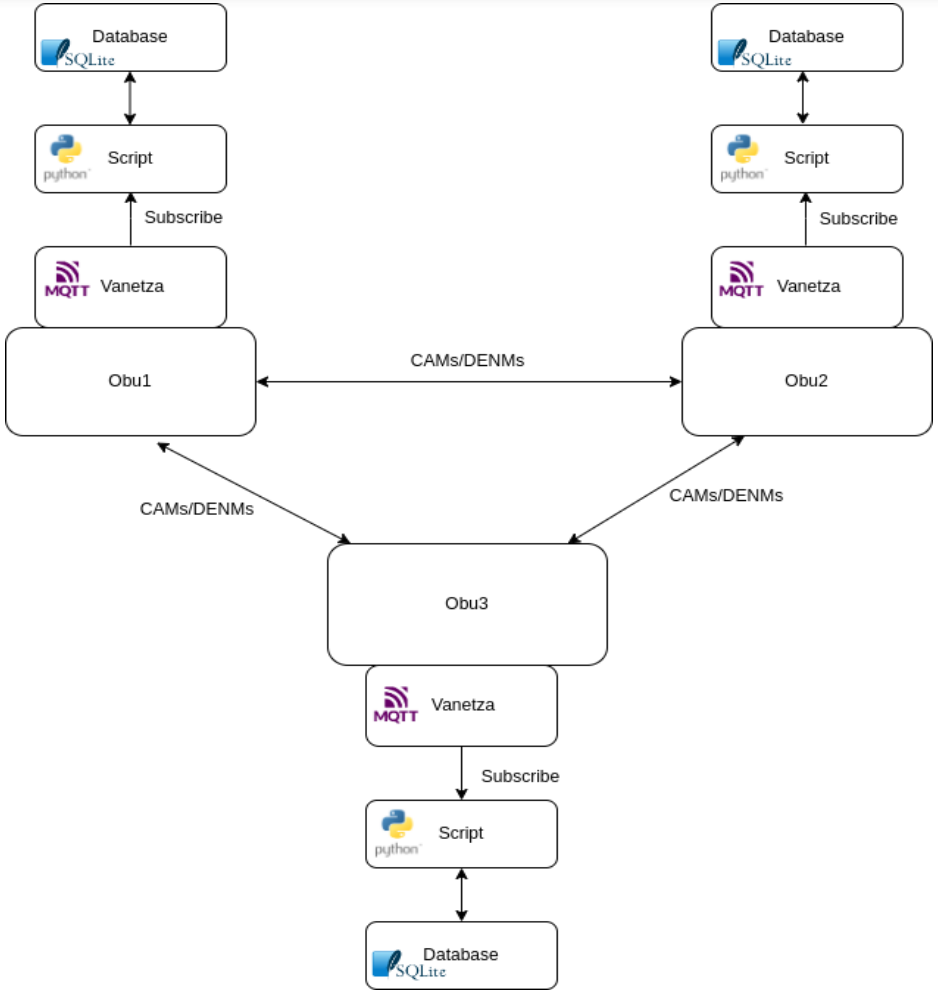
- CAMs (Cooperative Awareness Messages):
  - ❑ The drones are aware of each other's position.
  - ❑ Contain drone position, stationID, stationType, speed...

- DENMs (Decentralized Environmental Notification Messages):
  - ❑ DENMs are sent after the drone analyze the agricultural field .
  - ❑ Used to notify drones with the result of the analysis of agricultural fields.
  - ❑ CauseCode contains the result of the analysis.

General Architecture

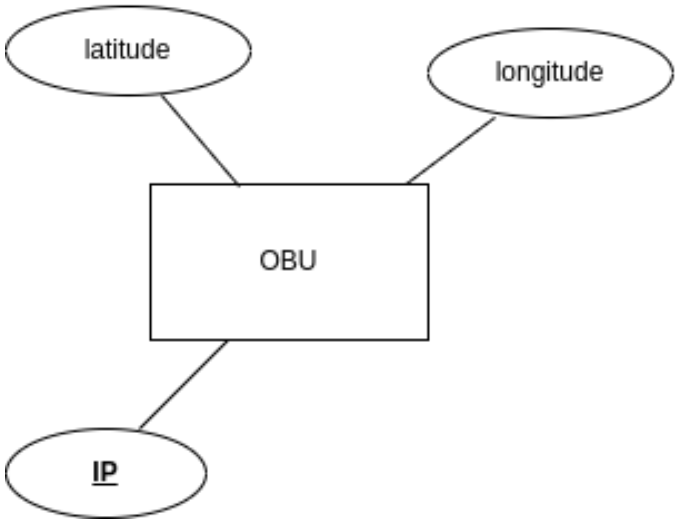


OBUs Architecture



DataBase

OBU DataBase



Zones DataBase

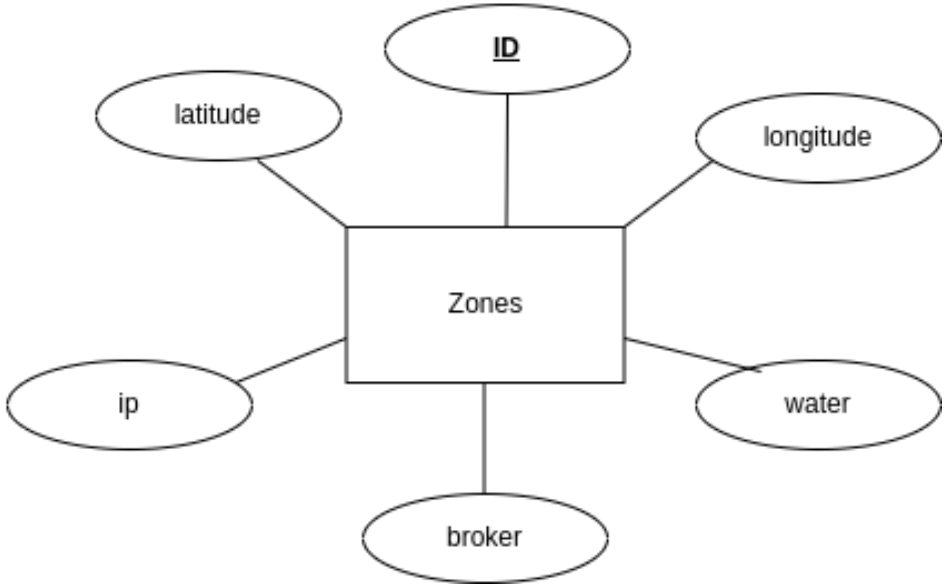


Image Processing

- Each zone will have an image associated with it, in order to simulate the images captured by drones in real life situation.
- Then, when a drone arrives to a zone, that zone image is passed as a parameter in a function. That same function will look for pixels with green, yellow and brown colors (most abundant colors in an agricultural field).
- Afterwards, the total number of pixels and the number of pixels for each color are calculated in order to calculate the percentage of green, yellow and brown pixels in the image and the result will determine whether or not the area needs to be watered.
- The images below are an example of the result of analyzing an image.

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The percentage of green pixels in the image is:  85.28960905349794
The percentage of yellow pixels in the image is:  14.512345679012345
The percentage of brown pixels in the image is:  2.9495884773662553
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Timeline

- At the start, the 3 drones will be in a starting position and there will be 5 zones on the map.
- Then the drone go towards to the zone closest to them, without knowing if it is occupied or not, while sending CAMs to other drones.
- When receiving the CAM, it checks if the drone that sent it is close to a zone (15 meters away). If it is close to a zone, the drone that received the CAM updates its database with the new occupied zone.
- When a drone arrives at a zone, it analyze that zone and sends a DENM to the others, with the result of the analysis, so that they can update their database and then he search for a new area.
- If there are no more zones to analyze, the drone returns to the starting position.

Zones and OBUs