**CRAWL**

* Each node is equipped with microcontroller for sensing of water and pressure and actuation of motor.
* The microcontroller will be communicating with the aggregator via LoRa communication
* Now, collect the data from each node and upload all the nodes data, threshold levels & willingness of each node to the topic “NODES” in broker.hivemq.com server using MQTT communication protocol
* A python script will be subscribed to this topic using paho-mqtt library and will be waiting for the data to come in.
* As soon as the data will be posted on this topic, the data will be parsed and each node data, threshold levels and willingness of nodes to supply water is extracted.
* Depending on the threshold levels, the nodes are categorized into three categories.
* They are:
  1. Deficit Nodes
  2. Surplus Nodes
  3. Sufficient Nodes
* Check for deficit nodes, if there are no deficit nodes found or if all the nodes are deficit, then publish the response to topic “NODE RESPONSE” in broker.hivemq.com server in the following way by setting all the valves and motors of each node to OFF.

Example: N1/130/68/V/OFF/M/OFF N2/80/90/V/OFF/M/OFF N3/65/60/V/OFF/M/OFF

* Now, calculate the quotients using the following expression:

**(0.7\*(distance/100)) + (0.3 \* willingness)**

* Check for surplus nodes, if found, then publish the response to the topic “NODE RESPONSE” in broker.hivemq.com server in the following way by setting the deficit nodes valve to ON, sufficient nodes valve and motor to OFF and surplus nodes valve and motor to ON.

Example: N1/130/68/V/ON/M/ON N2/35/90/V/ON/M/OFF N3/65/60/V/OFF/M/OFF

* If no surplus nodes found, then publish the response to the topic “NODE RESPONSE” in broker.hivemq.com server in the following way by setting the deficit nodes valve to ON and sufficient nodes valve and motor to ON. Example: N1/39/68/V/ON/M/OFF N2/35/90/V/ON/M/OFF N3/65/60/V/ON/M/ON
* This response from the python script is visualized using python’s tkinter library which is subscribed to the topic “NODE RESPONSE”.
* Using this tkinter library, the pipes and wells are designed for each node and their motor and valve status are mentioned. Also, the water level is also marked.
* The aggregator is also subscribed to the “NODE RESPONSE” topic and the control signals are sent to the respective nodes depending on the data from the subscribed topic.
* The above-mentioned steps will repeat in the same manner.