RSA – Project Presentation

Automatic Nautical Sensor Data Collection

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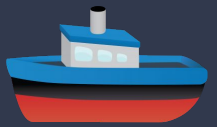
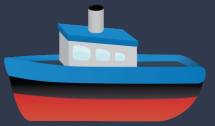
Objectives



- Develop an autonomous system which allows to collect nautical information
  - Safety : No need human intervention
  - Efficiency : Autonomous system are better than other methods
  - Environmental monitoring : Maintain water quality
- Base Station (RSU)
  - Receive all the information coming from the autonomous boats
  - Start operation and sharing sensor location information
- Autonomous boat (OBUs)
  - Three autonomous boats to cover a significant area of water
  - Navigation system
- Sensors
  - Temperature, Conductivity, depth
  - ph, dissolved oxygen, nutrient_levels
  - oxygen, carbon dioxide, methane

Simulation Environment

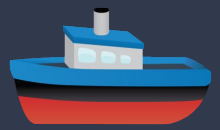


- We make use of:
  - 5 Docker Containers (3 Boats, 1 Base Station, 1 Watcher)
  - 1 Hosted MQTT Broker

- Watcher: used to simulate the communication range between the boats and between the boat and base station

- Sensors: boat arrives at the sensor location, it publishes a message on the hosted mqtt broker, this message is processed by a python script that randomly generates the information that would be collected by a real sensor. This generated information is published in the hosted mqtt broker arriving at the boat that requested the sensor information.

Architecture



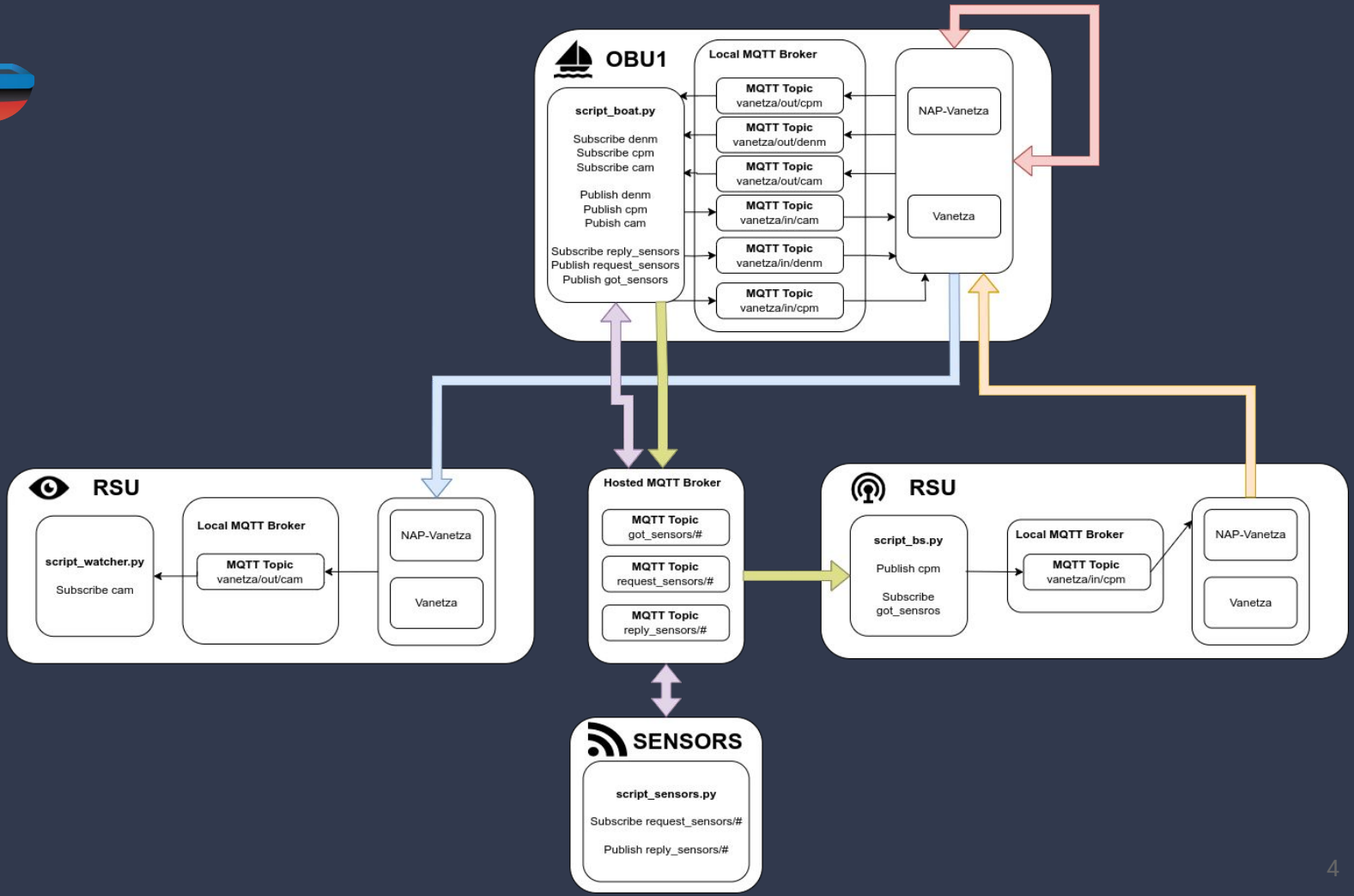
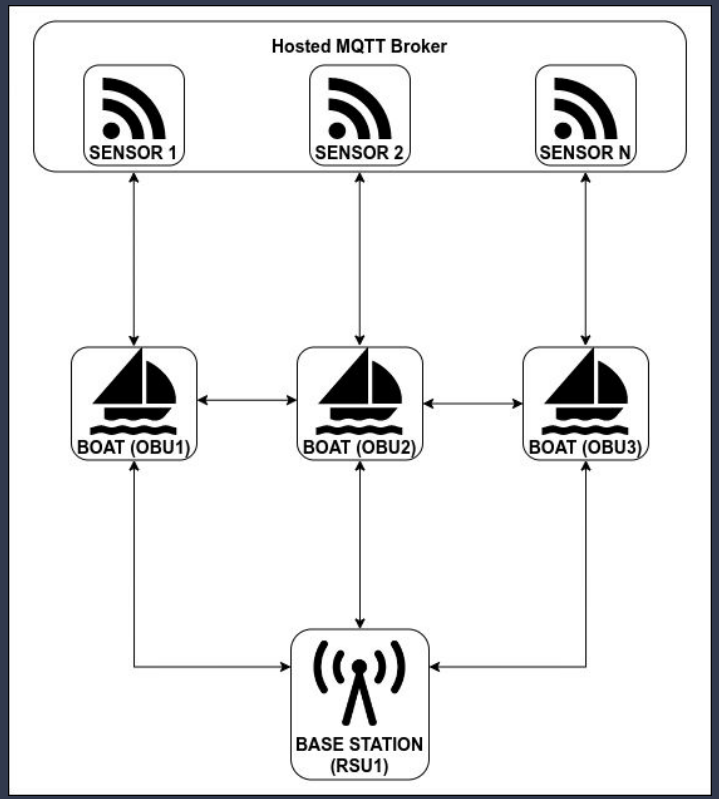


Diagram of Implementation



Message Types

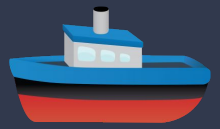
Between OBUs	
cam	Send current and future position
denm	Send the picked sensor position
cpm	Send unavailable sensors

RSU to OBUs	
cpm	Send location of sensor in the water

OBUs to RSU	
got_sensors	Sends the data collected from the sensors

Between OBUs and Sensors	
request_sensors	Sends the location of the desired sensor
reply_sensors	Replies with the data collected by the requested sensor

Timeline



Start Operation

Send cpm message with location of all sensors

Moving

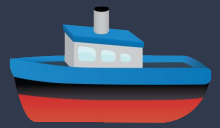
The boats receive the cpm message and start moving

Collect Data

The OBU sends a request for the sensor info, the sensor replies with the data it collected.

Delivery

The OBU arrives at the base station and sends the collected sensor data to the RSU.



Timeline - Between Moving and Collect Data

Announce Picked Sensor

The OBU announces the sensors it's going to collect, broadcasting DENM messages

Receives DENM

The message is received. If this OBU has the same sensor picked, it checks if he is closer to the sensor, if so it keeps the sensor else it picks another sensor from the available ones

Send Current and Future Positions

The OBU makes use of the cam messages to send to the other boats it's current position and future position. Thus allowing others in the vicinity to know it's position

Announce Unavailable Sensors

The OBU announces the sensors that are already collected by him and by the others, broadcasting CPM messages

Receives CPM

The sensors in the message are removed from the available pool, if not already. If the picked sensor suddenly becomes unavailable another sensor is picked from available pool

DEMO