Air Quality Monitor

Test plan

Group 09

E/15/180
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- Focus
  - Items/Functionalities that are going to be tested under our test plan.
  - Items/Functionalities that are **not** going to be tested.

The Air Quality Monitor would be tested under three selected test types. They are;

- Unit testing
- Integration testing
- Load testing

1. **Test type :** Unit testing

- **Objective:** Verify the behavior of the Air Quality monitor independently from other parts and ensure that every single unit in the system works correctly.

- **Inputs:**
  - input of sensors are voltage
  - a string as a topic to verify workability of MQTT server

- **Measured Parameters:** Temperature, humidity, gasses in ppm(SO2, CO, CH4) respond(string) from publisher

- **Expected Output:**
  - After calibration, output from the temperature and humidity sensor should be equal to values around our working area.
  - Values of output of other sensors should be equal to values that can be taken from Chemical department in our faculty

  - When subscriber sends a string as a topic to publisher and publisher should respond to it by sending relevant data. Considering our project, if subscriber sends a message as 'SO2' and then publisher responds to it showing SO2 quantity in ppm, then it can say that the MQTT is working well.

- **Assumptions made:**
  - Output of each sensors are measured assuming that they are kept at the environment which has only relevant air around it. For example, SO2 sensor is kept in the environment, which includes only SO2 gases.

- Publisher and subscriber are in two different devices.

- **Testing process:**
  Under Unit test, each sensor will be tested separately. How it is that output of each sensor will be compared with corresponding standard values or the values around our working environment. For an example, output from the temperature and humidity sensor will be compared with the values around our working area. Other values can be taken from Chemical department in our faculty. Inputs of sensors are in voltage, but after calibrating each sensor separately it will display output as temperature in Celsius, humidity as percentage and other gas sensors in ppm.

  Workability of **MQTT** server will be tested using publisher and subscriber which are implemented within a same computer, even though they should be at two separated computers. When subscriber sends a string as a topic to publisher and publisher responds it by sending relevant data, then it can say that the MQTT is running properly. Considering our project, if subscriber sends a message as 'SO2' and then publisher responds to it showing SO2 quantity in ppm, then it can say that the MQTT is working well.

2. Test type: Integration Testing

- **Objective:** To demonstrate that different parts of a system work together in the real-life environment with the use of external resources

- **Inputs:**
  - Input of sensors are voltage
  - A string as a topic to verify workability of MQTT server

- **Measured Parameters:** Temperature, humidity, gasses in ppm(SO2, CO, CH4) respond(string) from publisher

- **Expected Output:**
  - Responds which are as same as in unit test for MQTT server
  - LCD display should show quantity of each parameter same as values taken from each relevant unit test

- **Assumptions made:**
  - Output of each sensors are measured assuming that they are kept at the environment which has only relevant air around it. For example, SO2 sensor is kept in the environment, which includes only SO2 gases.

- **Testing process:**
  If our project is considered, it can be tested whether the data taken from sensors is sent to Main server using MQTT, while publisher and subscriber are in two devices. If we can get results as same as in unit test for MQTT, then it can realize that data transferring from sensors to Main Server happens properly.
  Furthermore, under this test, it can be checked whether data of every sensor is sent to database simultaneously by integrating each component of a node into a bread board. It can check whether the values shown at each unit test for every sensor can be seen in the LCD display. If it is, then it can finalize that all sensors are working correctly together.

2. **Test type :** Load Test

- **Objective:** To determine the speed, scalability of the system.

- **Inputs:** Voltage

- **Measured Parameters:** temperature in Celsius, humidity in percentage, gasses(SO2,CO,CH4) in ppm

- **Expected Output:** LCD display should show quantity of each parameter same as values taken from each relevant unit test

- **Assumptions made:**
  - Output of each sensors are measured assuming that they are kept at the environment which has only relevant air around it. For example, SO2 sensor is kept in the environment, which includes only SO2 gases.
  - Human errors at each time are same.

- **Testing process:**
  Final system will come up with the ability to response many nodes other than a single node. So, doing this test, we will get an idea about whether the embedded system will work for multiple nodes or not as well as how many factories *the Air Quality Monitor* can handle successfully and how it avoids the potential problems in future such as increased number of factories for the use of server.
  This will be done by sending topics to publisher by subscriber. For each node that would be act as unique ones, when it handles different main topics for each node and the publisher gets separate response relevant to each node, then it can say the system can handle many of nodes. In here, past data will be deleted after those data are re-presented in graphs. Then it can save more space in database for the future use.