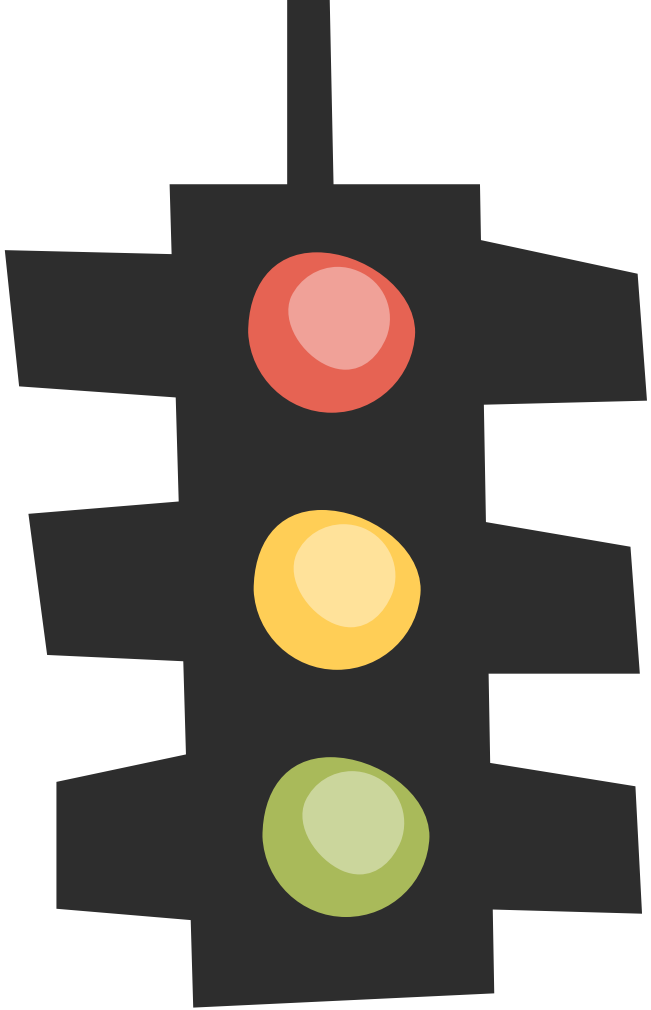
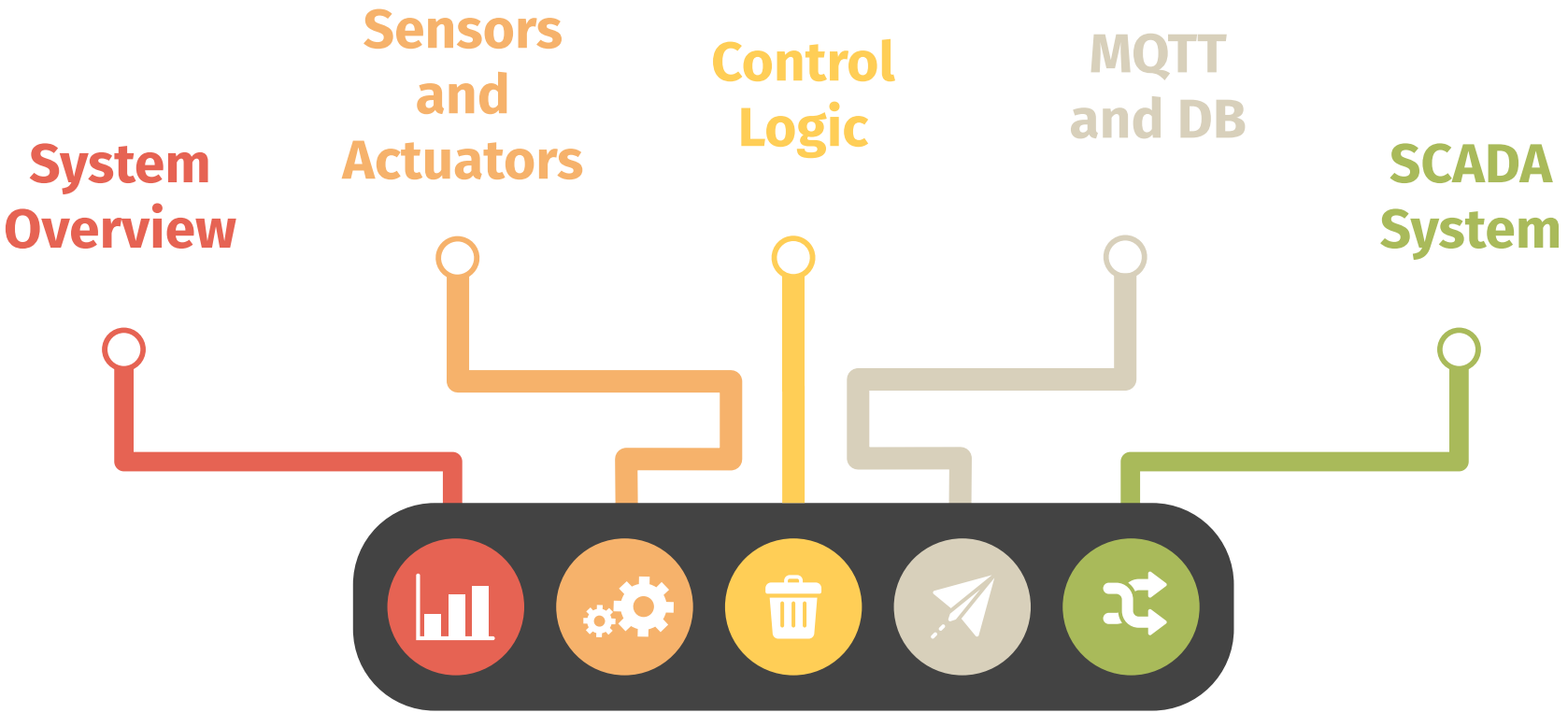
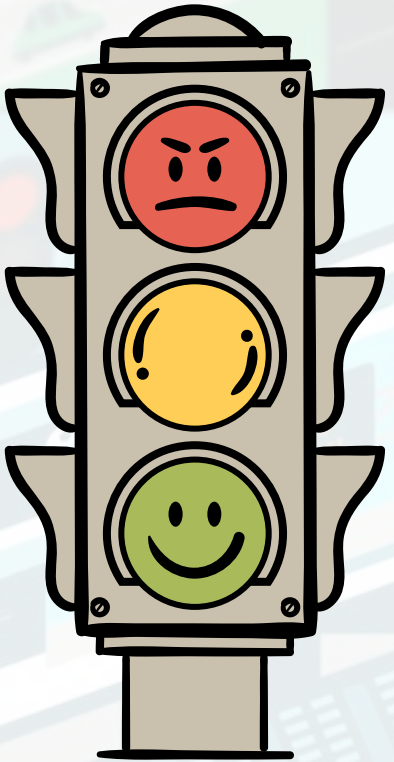


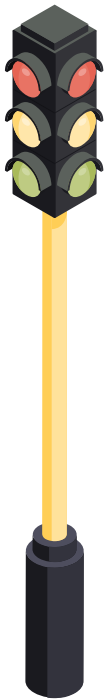
Smart Traffic Light System

Group 06
E/18/098 Ishan Fernando
E/18/100 Adeepa Fernando
E/18/155 Ridma Jayasundara

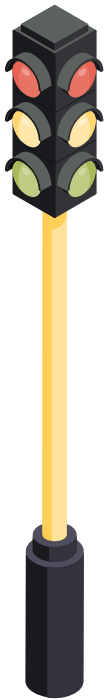

System Overview
Sensors and Actuators
Control Logic
MQTT and DB
SCADA System



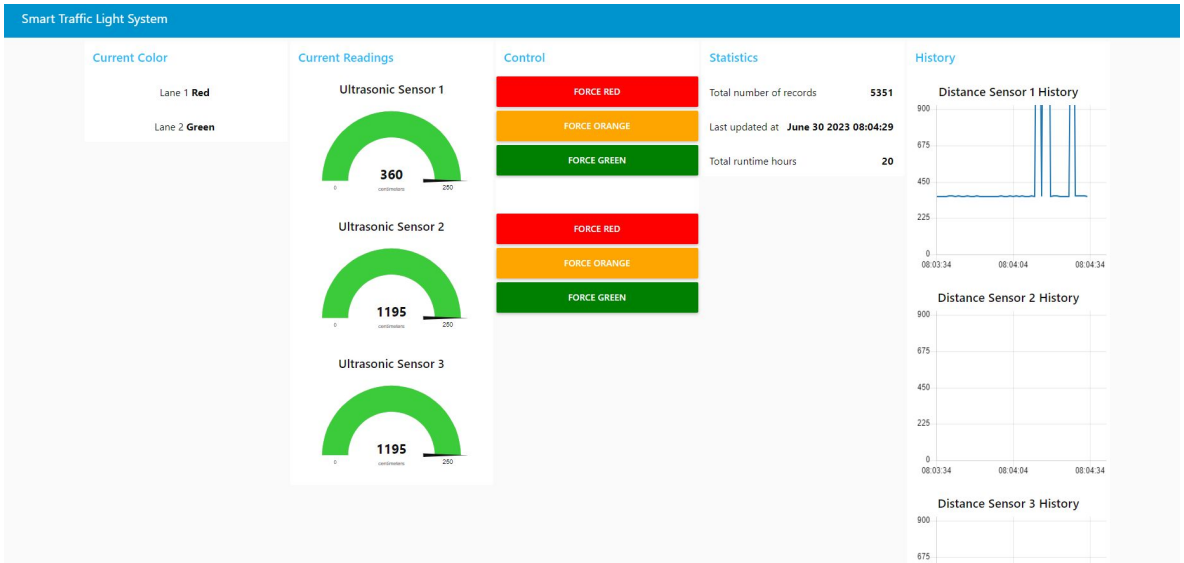
1. System Overview

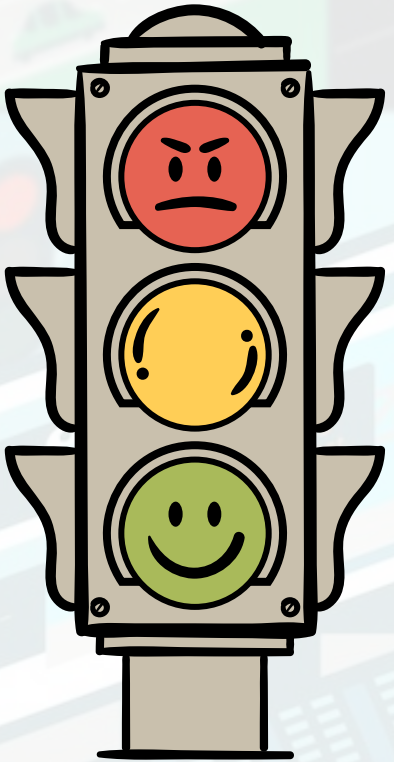


- IoT based Traffic Management System that allocates time for lanes based on the traffic amount
- Overcomes the redundancies of fixed time slot allocation for lanes



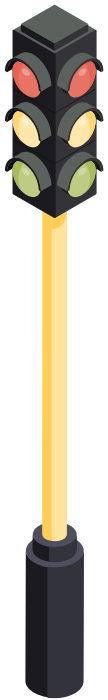
- Sends collected data from the sensor to a central MQTT Broker
- SCADA system to monitor and control the process.



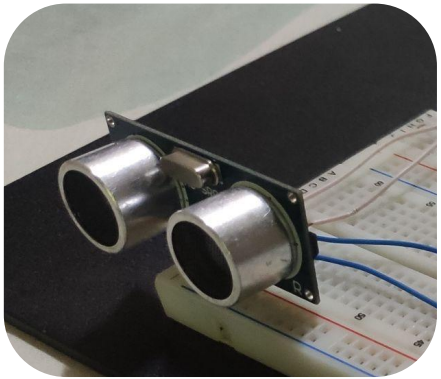


2. Sensors and Actuators

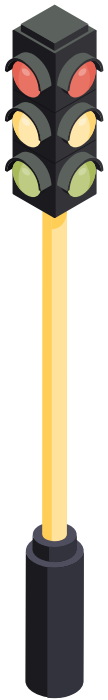
Sensors



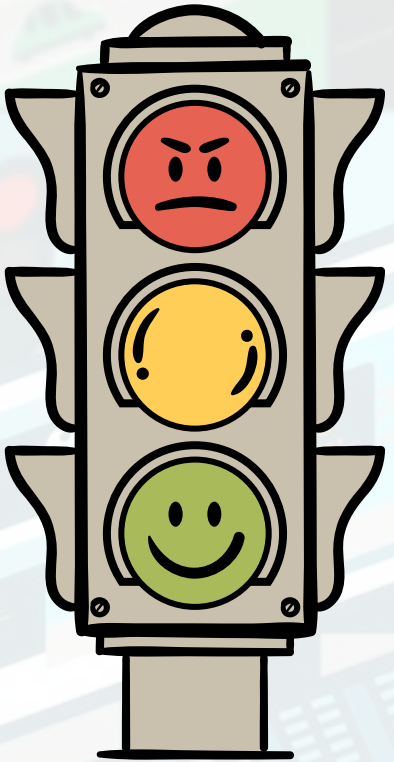
- Pair of ultrasonic sensors to get the measurement of how high traffic is in the lane
- Sensors are connected to the ESP32 microcontroller which acts as the controller of the sensor
- Measurements are timestamped at the reading and at SCADA.



Actuators

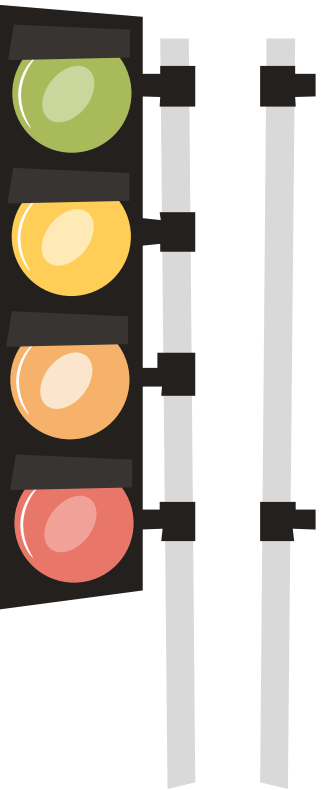


- Standard Red, Orange and Green color LED’s to demonstrate the traffic lights
- Actuators are also connected to the microcontroller which controls and collects status of the sensor.



4. MQTT and Database

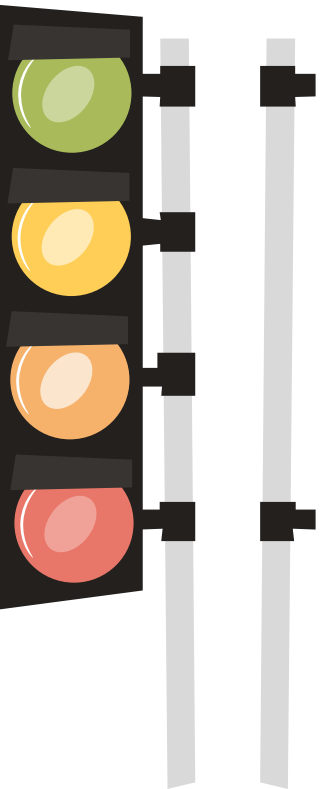
MQTT



- Using free MQTT service provided by test.mosquitto.org for the testing phase.
- Using MQTT, sensor data and status of actuators are transmitted to the MQTT broker
- Unified Namespace is used to identify sensors and actuators in the system.

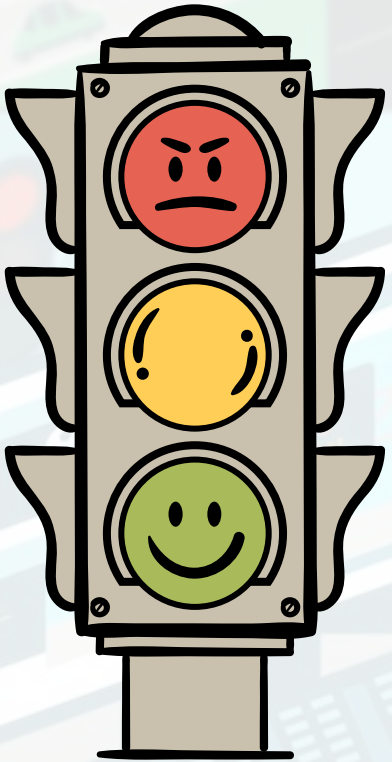

```
deviceName:
"trafficLightsNumber1"
timeMeasured: "June 30 2023
08:01:26"
distanceSensor1: "361"
distanceSensor2: "1195"
distanceSensor3: "1195"
currentColor1: "R"
currentColor2: "G"
```

Database



- Data coming from MQTT broker is stored in a database to store non real time values of the system
- MongoDB Atlas was used in this system.

```
_id: ObjectId('649e3d919090ea41e87efd37')
deviceName: "trafficLightsNumber1"
timeMeasured: "June 30 2023 07:57:27"
distanceSensor1: "2942"
distanceSensor2: "1195"
distanceSensor3: "1195"
currentColor1: "R"
currentColor2: "R"
NodeRedReceivedTime: 2023-06-30T02:27:29.030+00:00
```



4. SCADA

Smart Traffic Light System

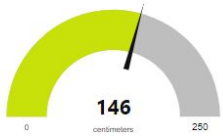
Current Color

First set **Red**

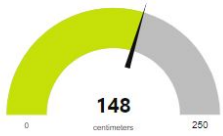
Second set **Red**

Current Readings

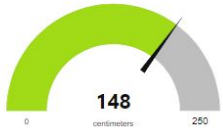
Ultrasonic Sensor 1



Ultrasonic Sensor 2



Ultrasonic Sensor 3



Control

FORCE RED

FORCE ORANGE

FORCE GREEN

FORCE RED

FORCE ORANGE

FORCE GREEN

Statistics

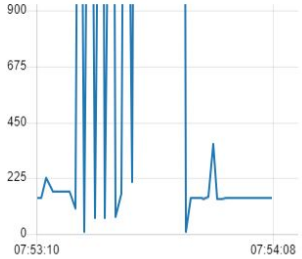
Total number of records **4828**

Last updated at **June 30 2023 07:54:06**

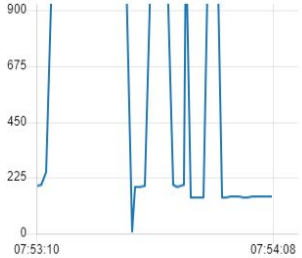
Total runtime hours **19**

History

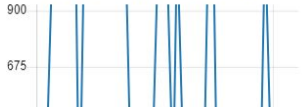
Distance Sensor 1 History



Distance Sensor 2 History



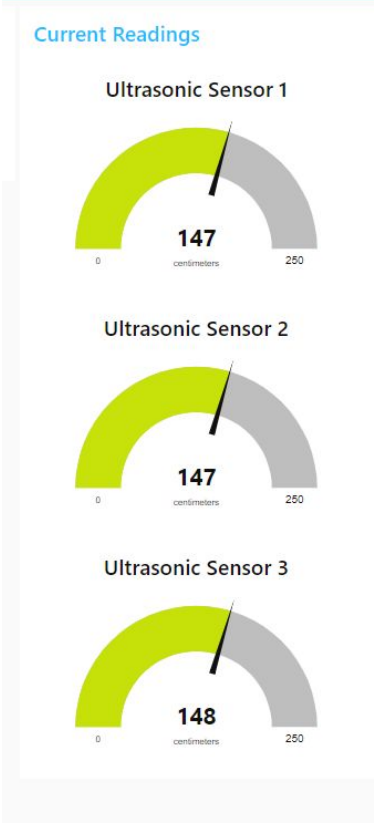
Distance Sensor 3 History



Digital Display and Present Event

- Actuator status, in this case current LED color can be monitored through the SCADA system.

Analog Display



- Sensor status, the distance measurements from the ultrasonic sensors can be monitored.

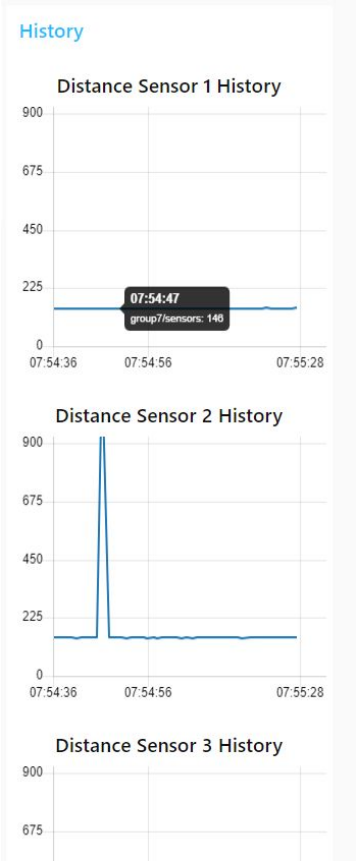
Control Digital

- When the traffic light color needs to be controlled manually, these buttons can be used.

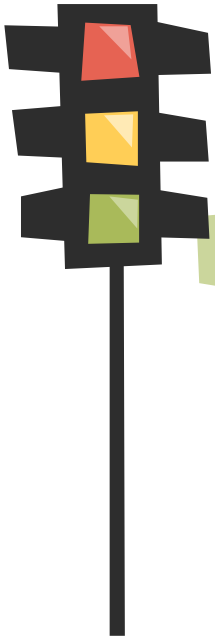
History from the Database

- Database stats can be viewed from the SCADA interface

History from the Database



- Graphical representation of resent sensor measurements, data taken from the database



Thank You !