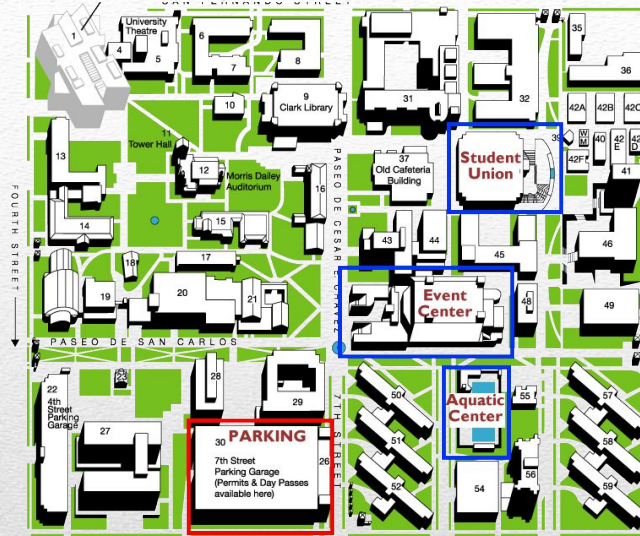


Introduction



Problem

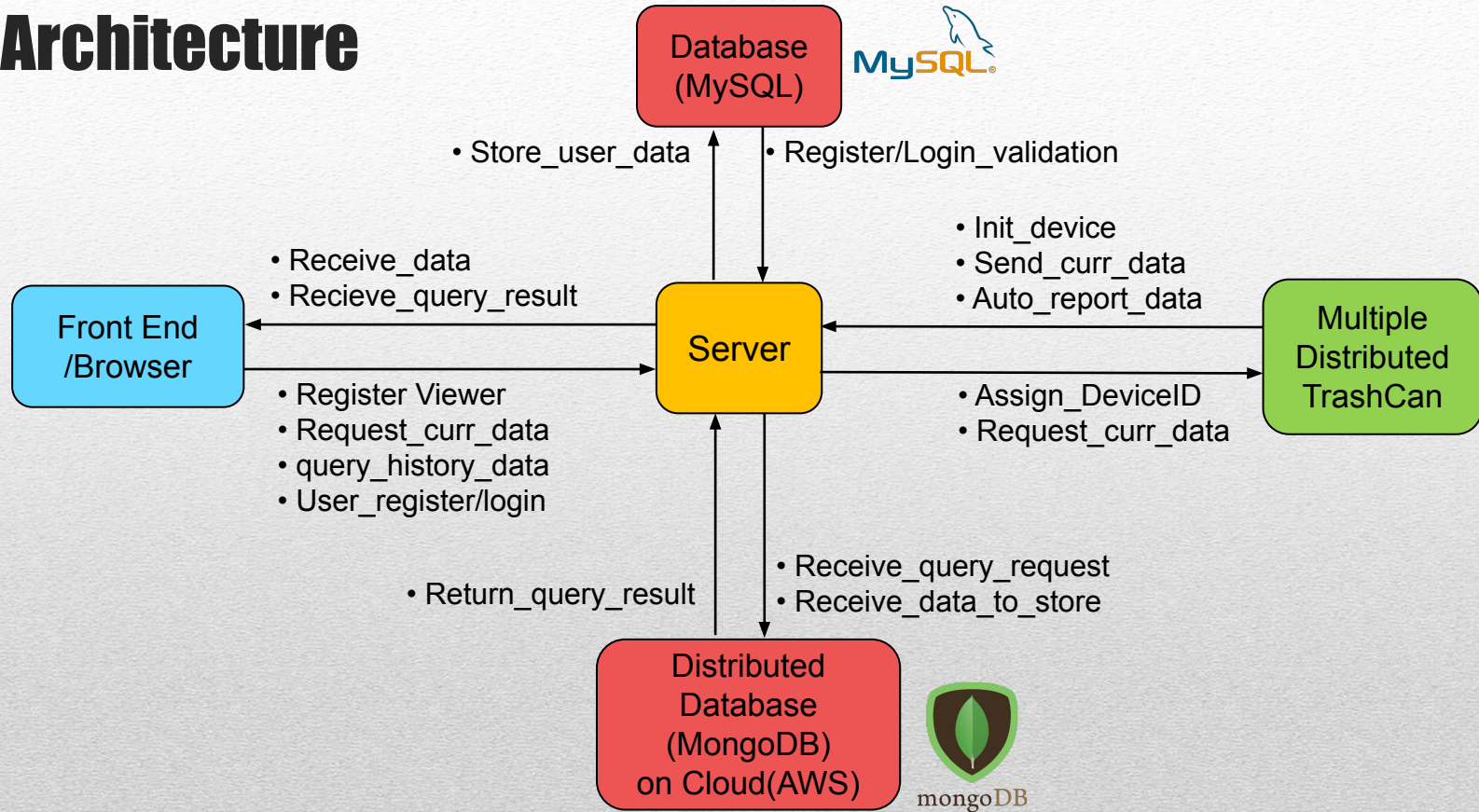
- Increasing trash problem
- The number and size of trash can needed
- Trash collection planning



Solution

- Real time trash data monitoring (weight/volume)
- History trash data analysis
- Email notification system

Architecture



Database Data Schema

User Table on MySQL	
username	VARCHAR(255)
password	VARCHAR(255)
privilege	VARCHAR(255)
Last_login	VARCHAR(255)

Trash Data Document on MongoDB

```
{  
  _id VARCHAR(45)  
  trash_can_id INT  
  lon DOUBLE  
  lat DOUBLE  
  volume DOUBLE  
  weight DOUBLE  
  timestamp VARCHAR(45)  
}
```

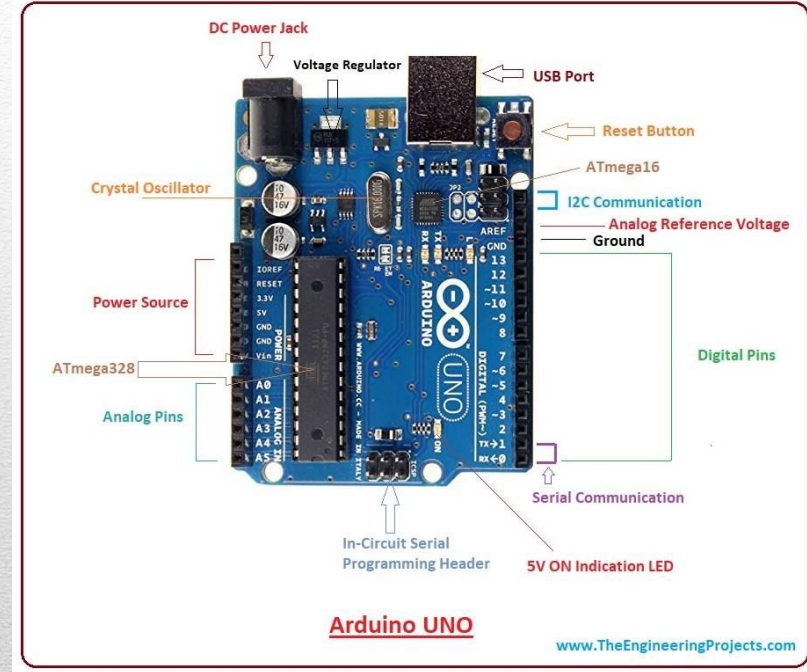
Device

Microcontroller Board:

- Arduino Uno

Sensors:

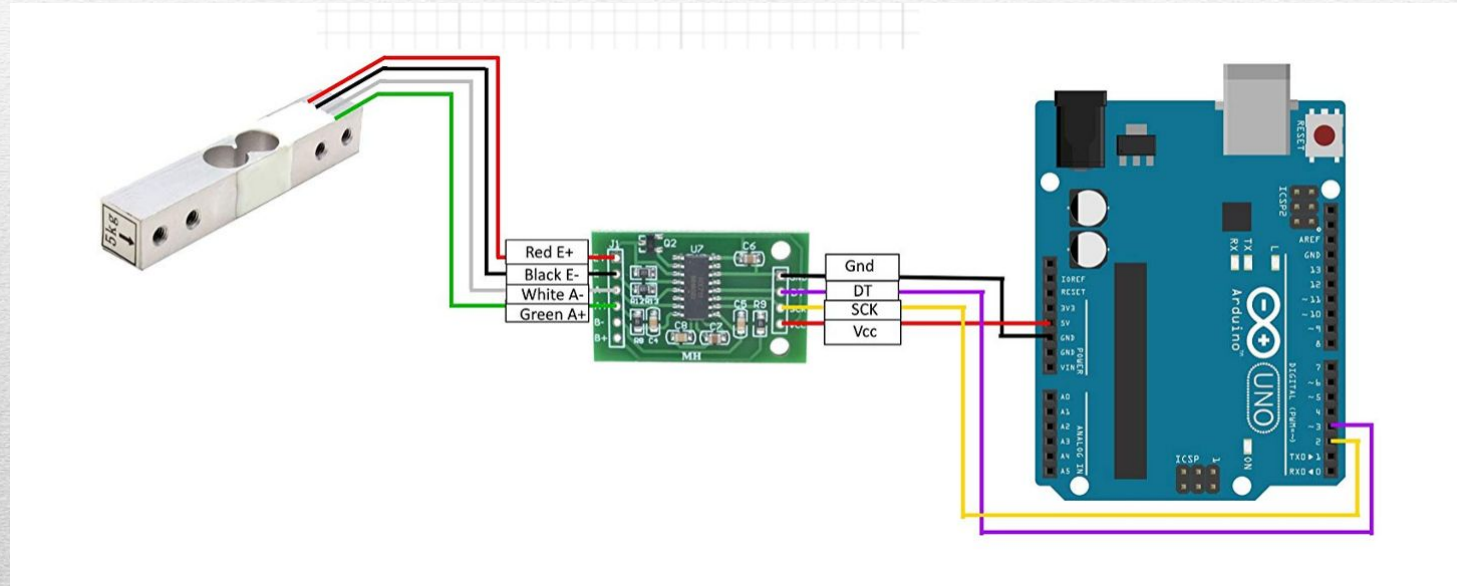
- Weight Sensor - 5kg Load Cell with HX711 Weight Sensor
- Distance (Volume) Sensor - HC-SR04 Ultrasonic Range Finder (2 cm - 400 cm)
- GPS Sensor - Simulation Data



Device

Sensors:

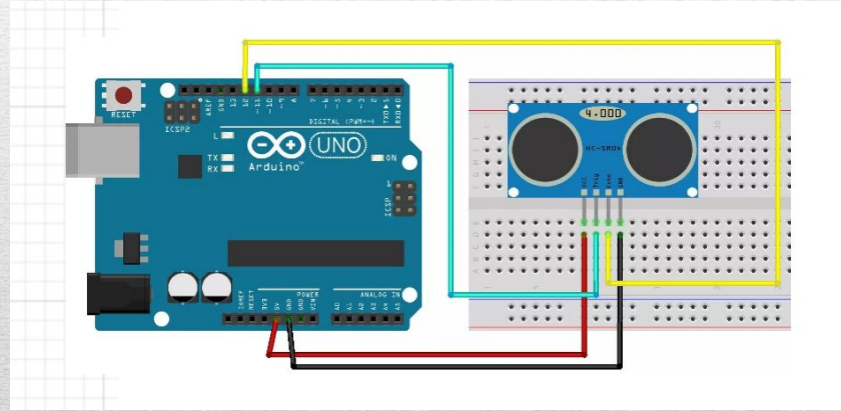
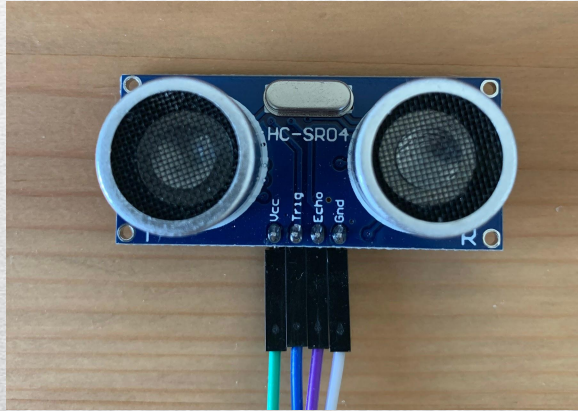
- Weight Sensor - 5kg Load Cell with HX711 Weight Sensor



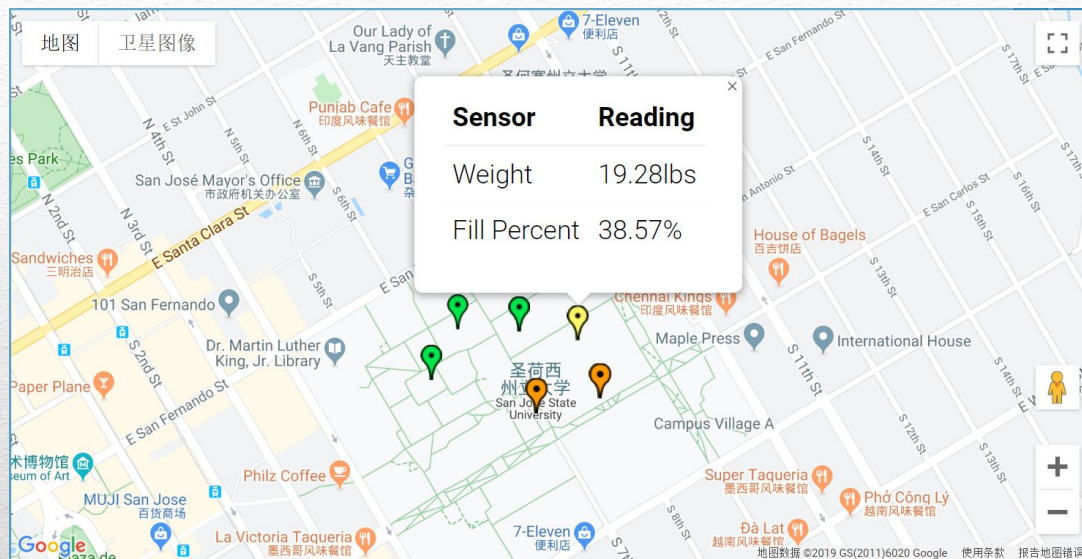
Device

Sensors:

- Distance (Volume) Sensor - HC-SR04 Ultrasonic Range Finder (2 cm - 400 cm)

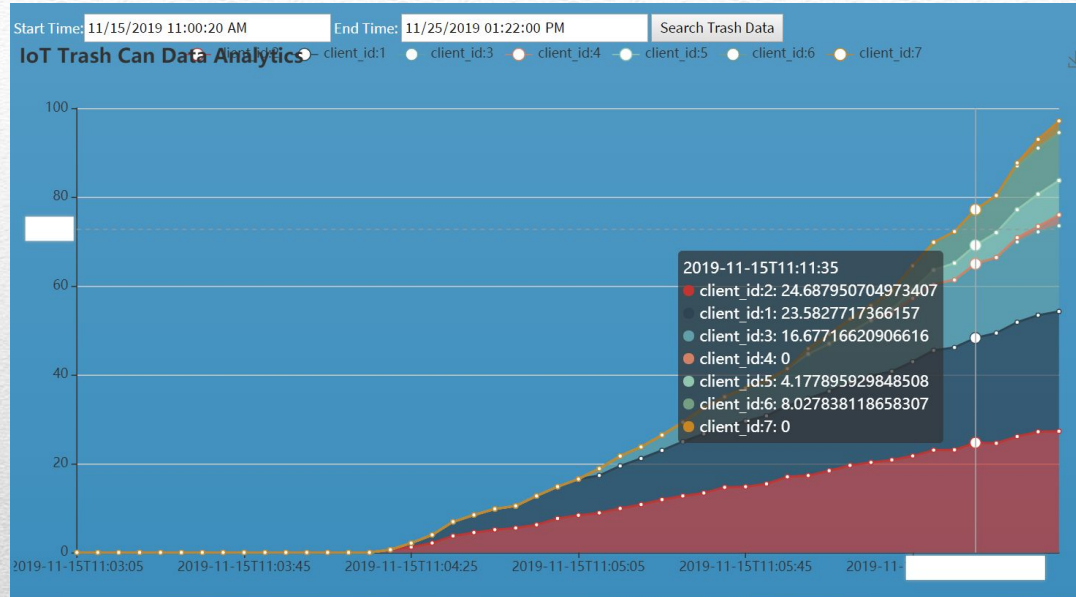


Use Case 1- Monitoring



- Sensors transmit data to backend server every 5s. Map updates in real time.
- Different color of map pins show different status of sensor. (Green: 0-25%, Yellow: 25%-50%, Orange: 50%-80%, Red: 80%-100%)
- Clicking on map pins can show the details status of the sensors.

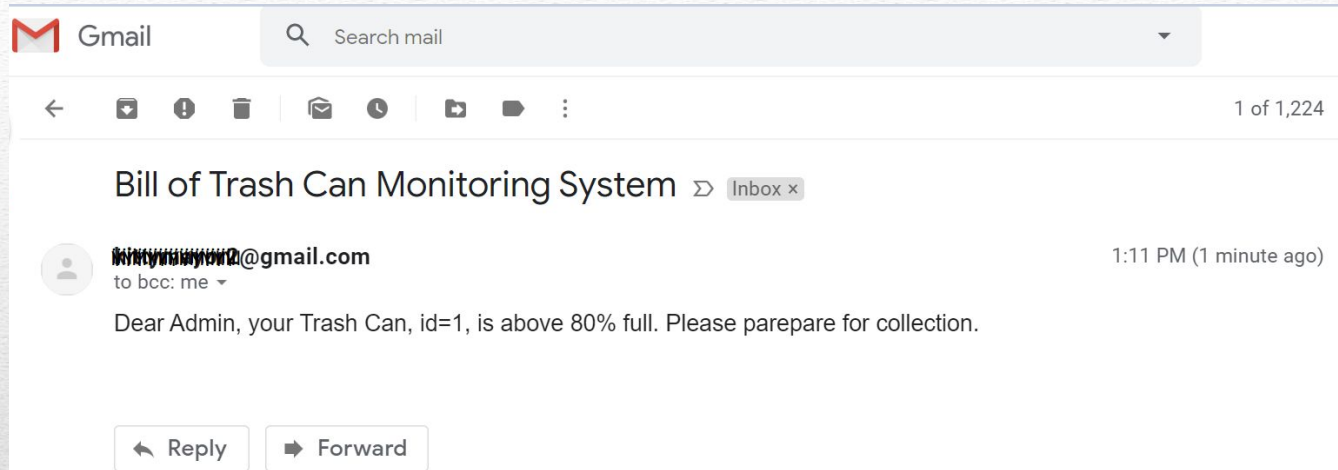
Use Case 2 - Analysis



The x-axis is the date and time, and the y-axis is the volume of the trash can.

- Users can know in which location and in which time the trash cans fill up quickly, so that they are able to plan the trash cans locations in the campus and trash collecting time in a better way.

Use Case 3 - Notification



- Users cannot keep monitoring the status of all sensors all the time. It's important to send a notification to users when there is a status change.
 - When a trash can become over 80% full, our system will send emails to the users to indicate the status change. Therefore, the users can prepare for a trash collection.
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