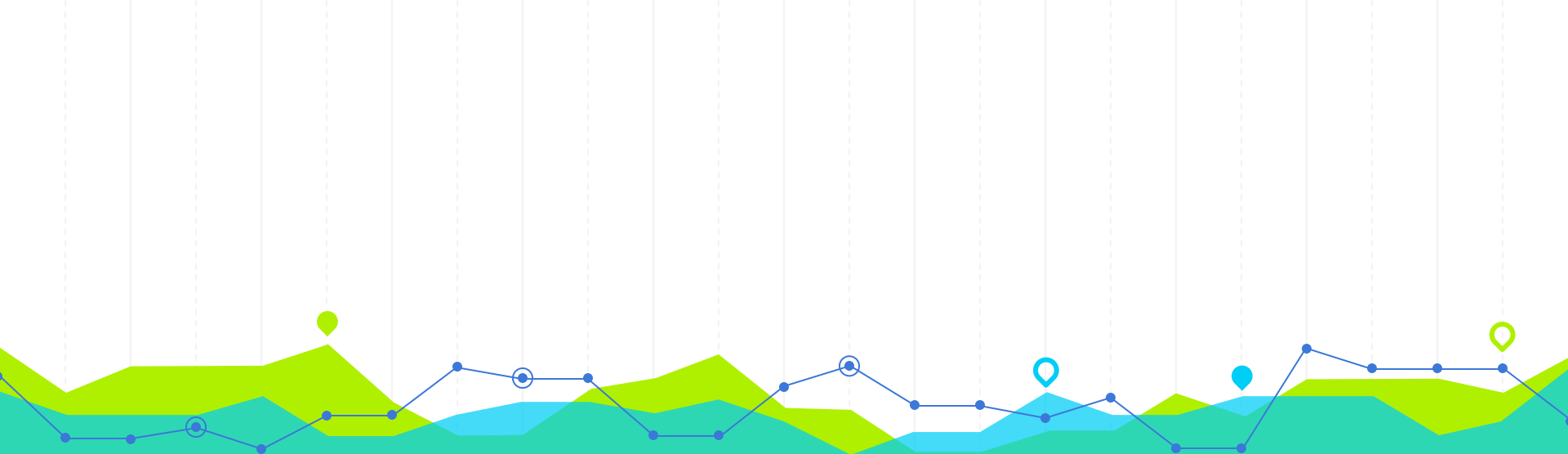


THE AIR POLLUTION PROJECT

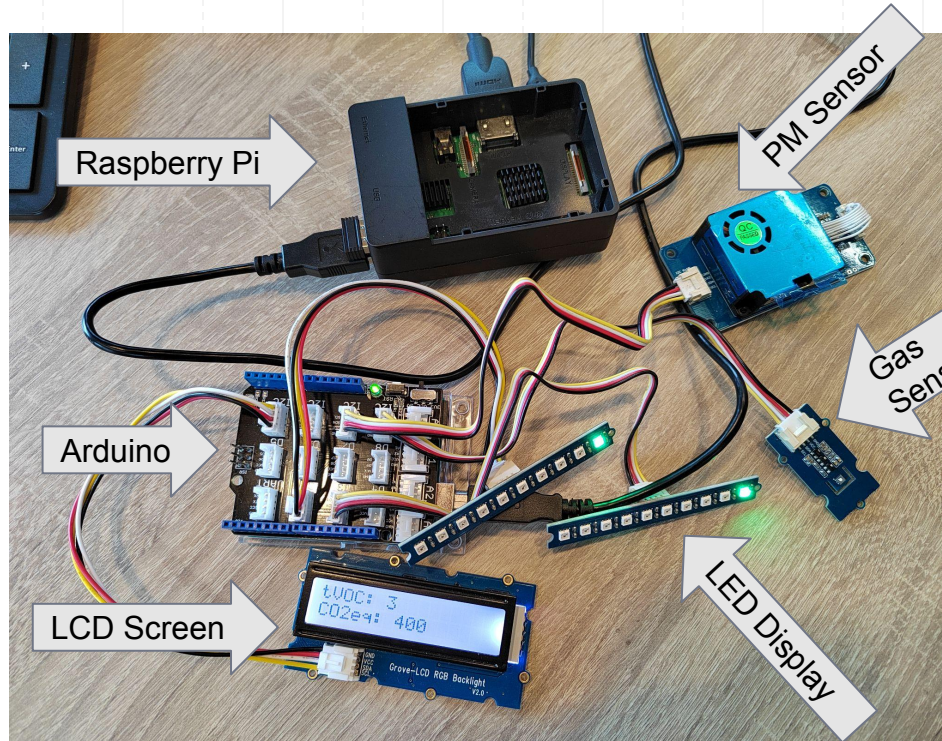
About Us





Devices Team

The Sensor Device



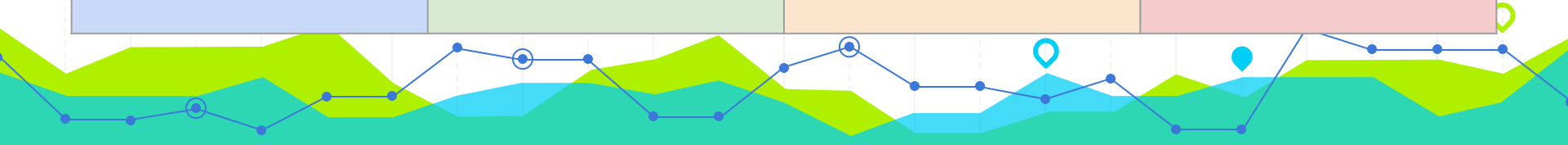
- Sensors can measure:
 - TVOC gases, CO₂
 - Particulate matter (PM)
- Displays levels of each type of pollution (LEDs, LCD screen)
- No WiFi capability without external module
 - decided Raspberry Pi was best for communication
 - Needed to couple time with the sensor readings.
 - Needed to reliably post and store data
- Device sends every reading to store in the database

What We Measure

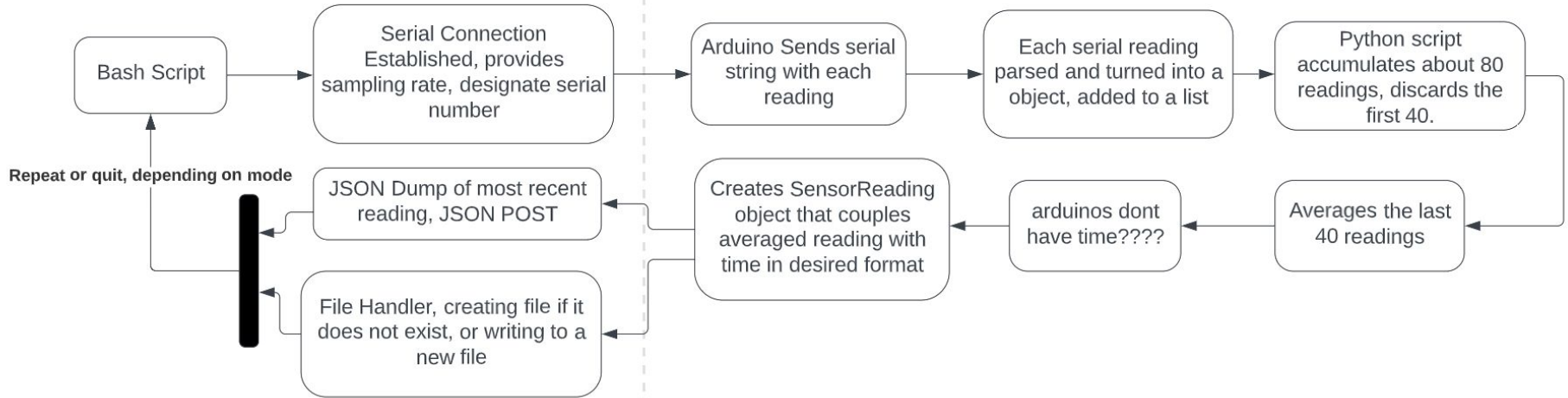
Pollution Type	Units	Description	Source
CO ₂	ppm	Carbon Dioxide.	Smoke, Emission
Volatile Organic Compounds (VOCs)	ppb	A group of gases or airborne liquids that can be toxic.	Cigarettes, Paints, Cleaning products
PM _{1.0}	µg/m ³	Particles < 1 micrometer in diameter. Small enough to enter bloodstream.	Wood smoke, tobacco smoke, Emission
PM _{2.5}	µg/m ³	Particles < 2.5 micrometers in diameter. Small enough to enter the lungs.	Bacteria, Fungi, Emissions
PM ₁₀	µg/m ³	Particles < 10 micrometers in diameter. Large enough to be caught by our nose hair and mucus.	Smoke, Soil, Dust, Pollen

Gas Pollutants	Safe level (Typical indoor/outdoor levels)	Potential Health Risk (May experience dizziness, headache, and other symptoms)	Danger level (Long term exposure can lead to permanent health damage)
CO ₂ (ppm)	400-1000	1000 - 5000	> 5000
Volatile Organic Compounds (ppb)	0-250	250-2000	> 2000

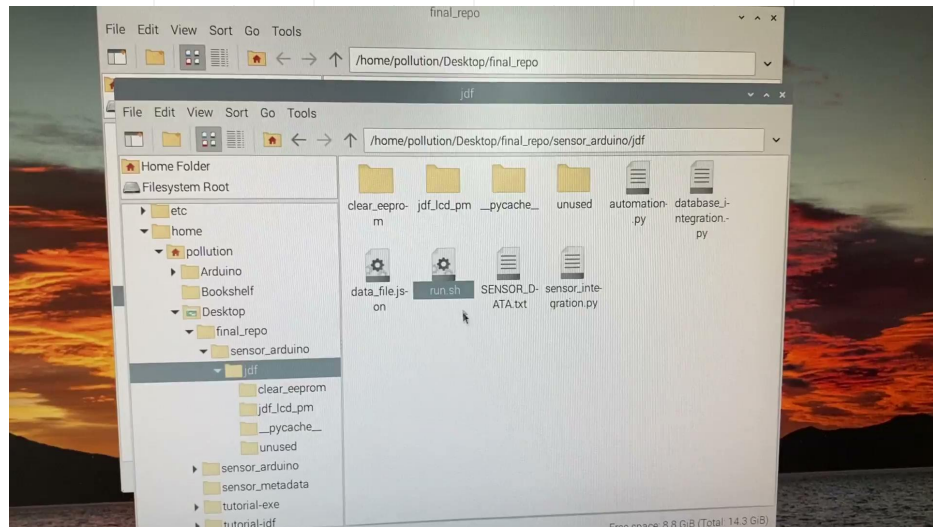
PM Pollutants	Safe level (Typical indoor/outdoor levels)	Unhealthy (May experience dizziness, headache, and other symptoms)	Hazardous level (Long term exposure can lead to permanent health damage)
PM1.0 ($\mu\text{g}/\text{m}^3$)			
PM2.5 ($\mu\text{g}/\text{m}^3$)	< 12	12 - 35	35 - 50
PM10 ($\mu\text{g}/\text{m}^3$)	< 50	50 - 150	< 150



Software Design



Device In Action

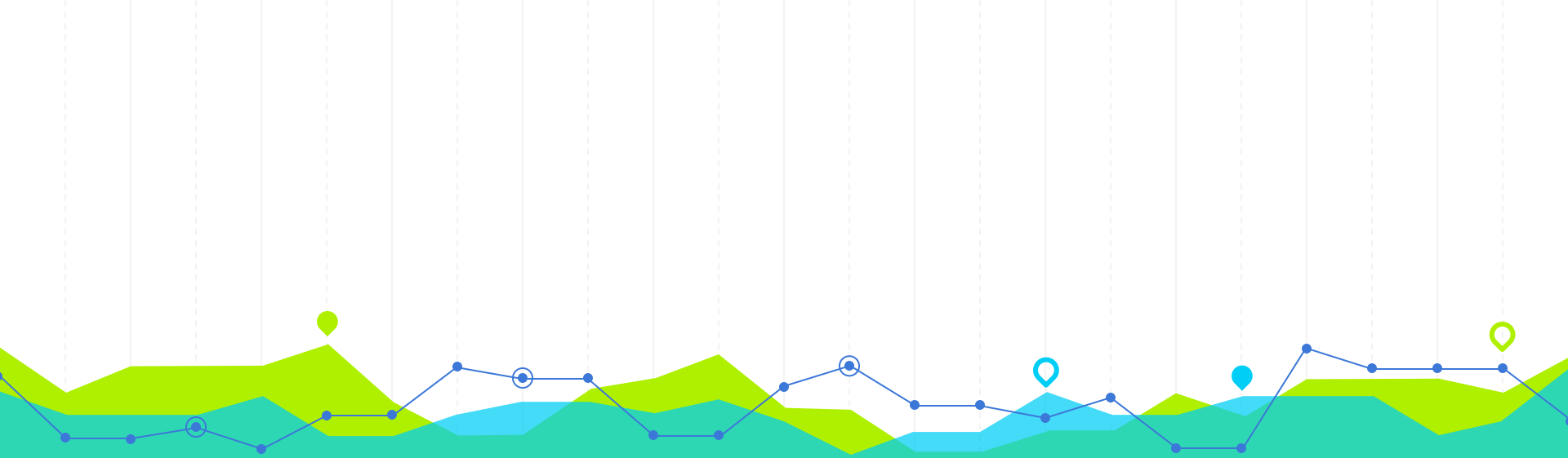


Sensor startup from
bash to python



Gas sensor reaction, readings, LCD
display and averaged reading

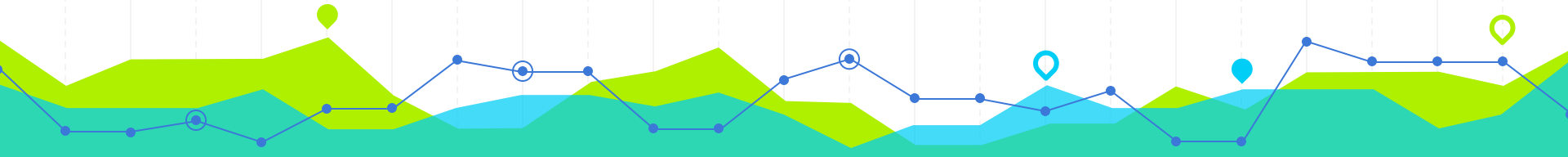




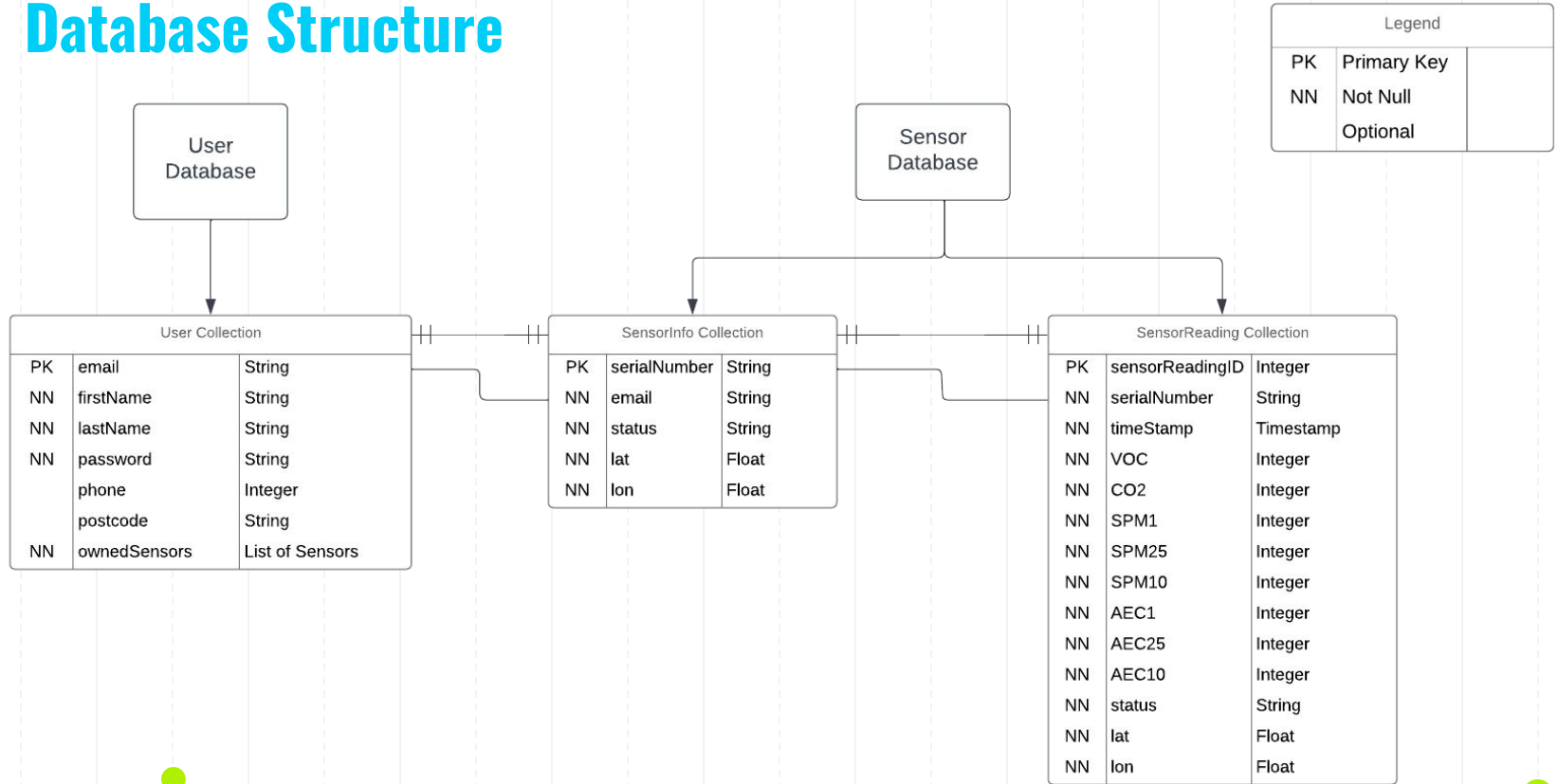
Database Team

Storage Strategy

- **Database is stored by using MongoDB through Amazon EC2 instance**
- **Users Database**
 - Stores information about users and sensors they own
- **Sensors Database**
 - sensorInfo collection: stores information about sensors and the email of their owner
 - sensorReadings collection: stores information about various pollutant readings, when they were taken, and what sensor serial number they came from



Database Structure



Archiving Data

UserService

- User's registration
- Edits information
- Delete account
- Get all owned sensors' information

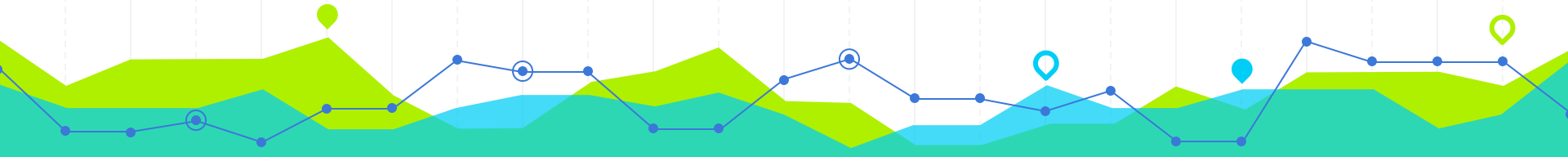
SensorService

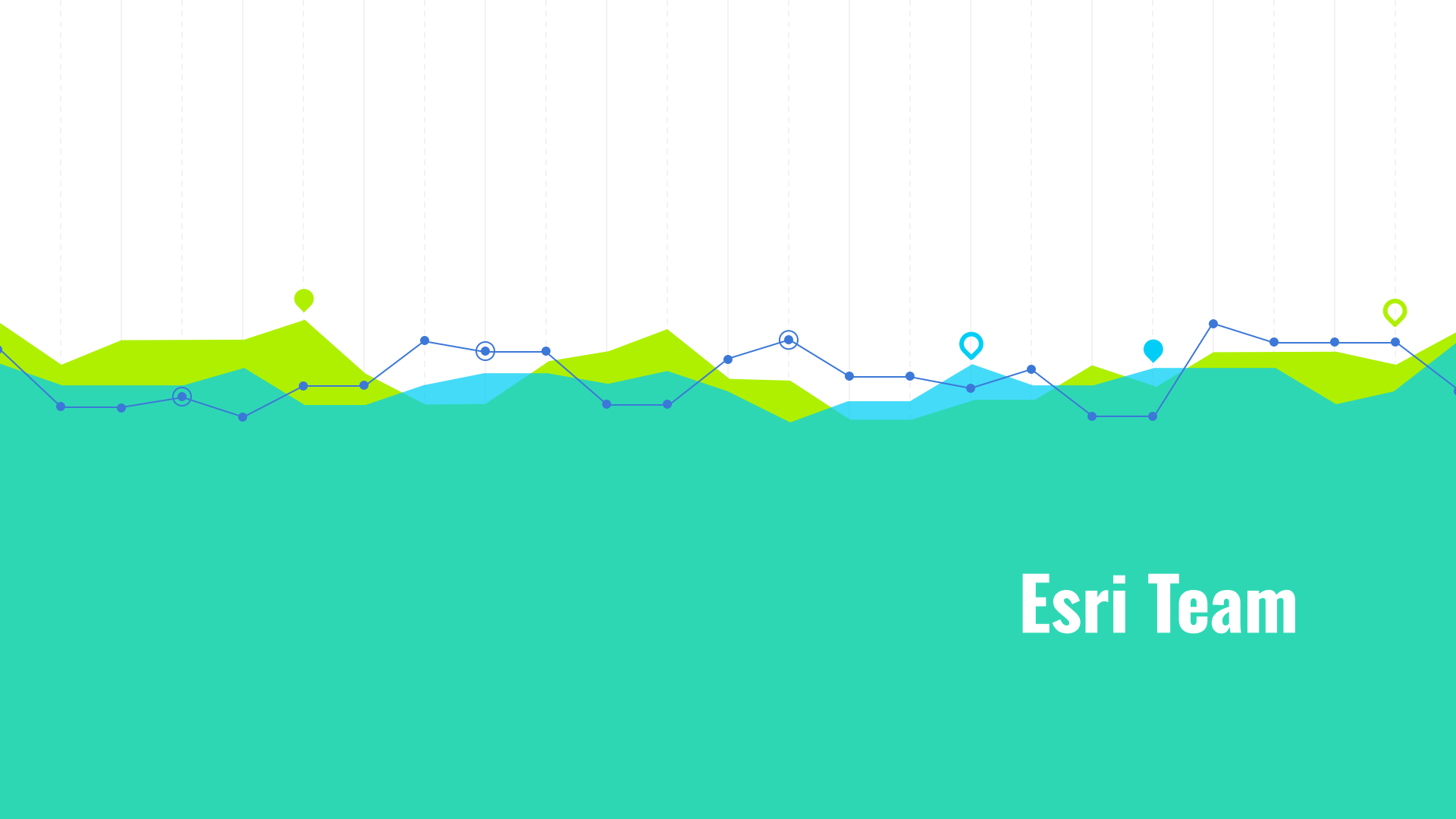
- Sensor registration
- Add sensor readings
- Edit sensor's information
- Delete sensor



Data Extraction to S3

- Automated data export from MongoDB database to Amazon S3 bucket via running a script with mongodump
- Data can be retrieved by the ESRI team by downloading the individual objects of the bucket
- Old data automatically deleted off database to make up space for the new data at client specified intervals





Esri Team

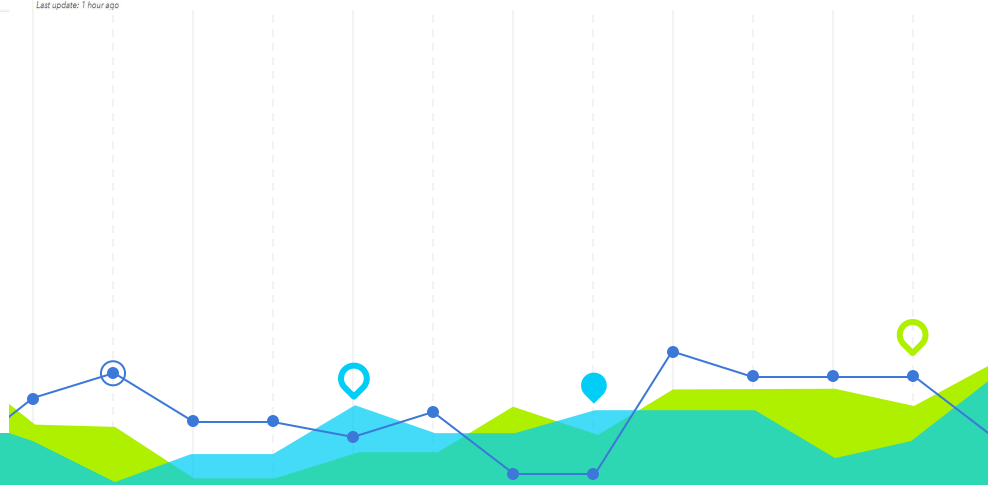
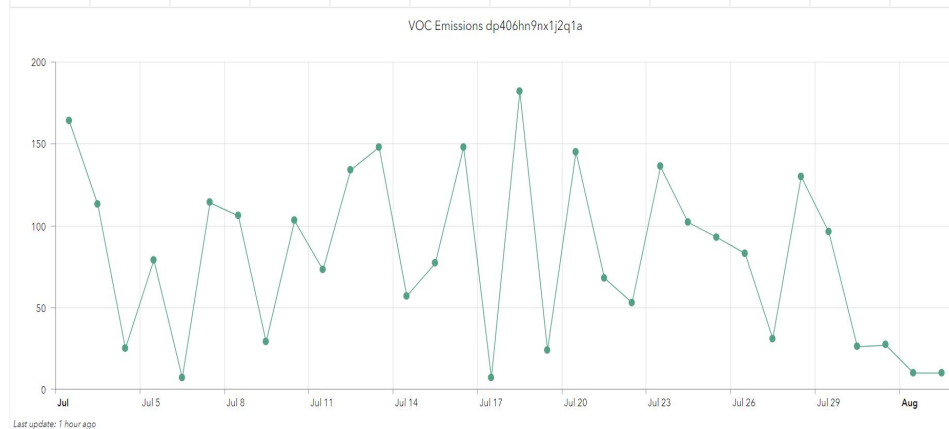
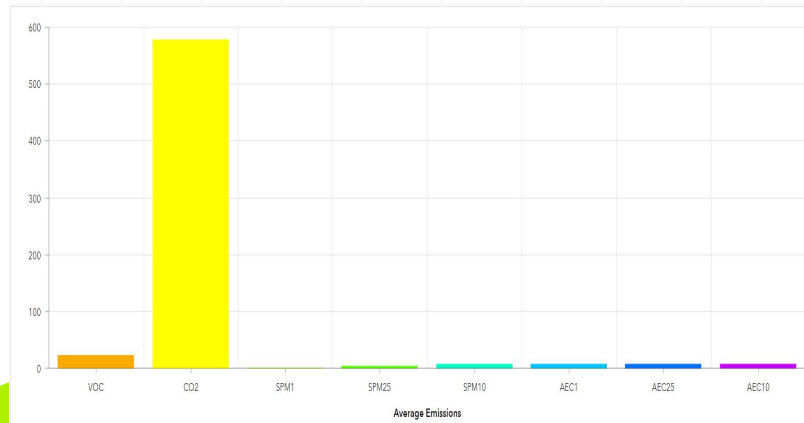
What We Do

- Request data from S3 database server
- Using said data we utilize the ESRI platform to create a visual representation of the data
- The data representation is automatically updated every month as new sensor data is received from the database team through the S3 database with backend code

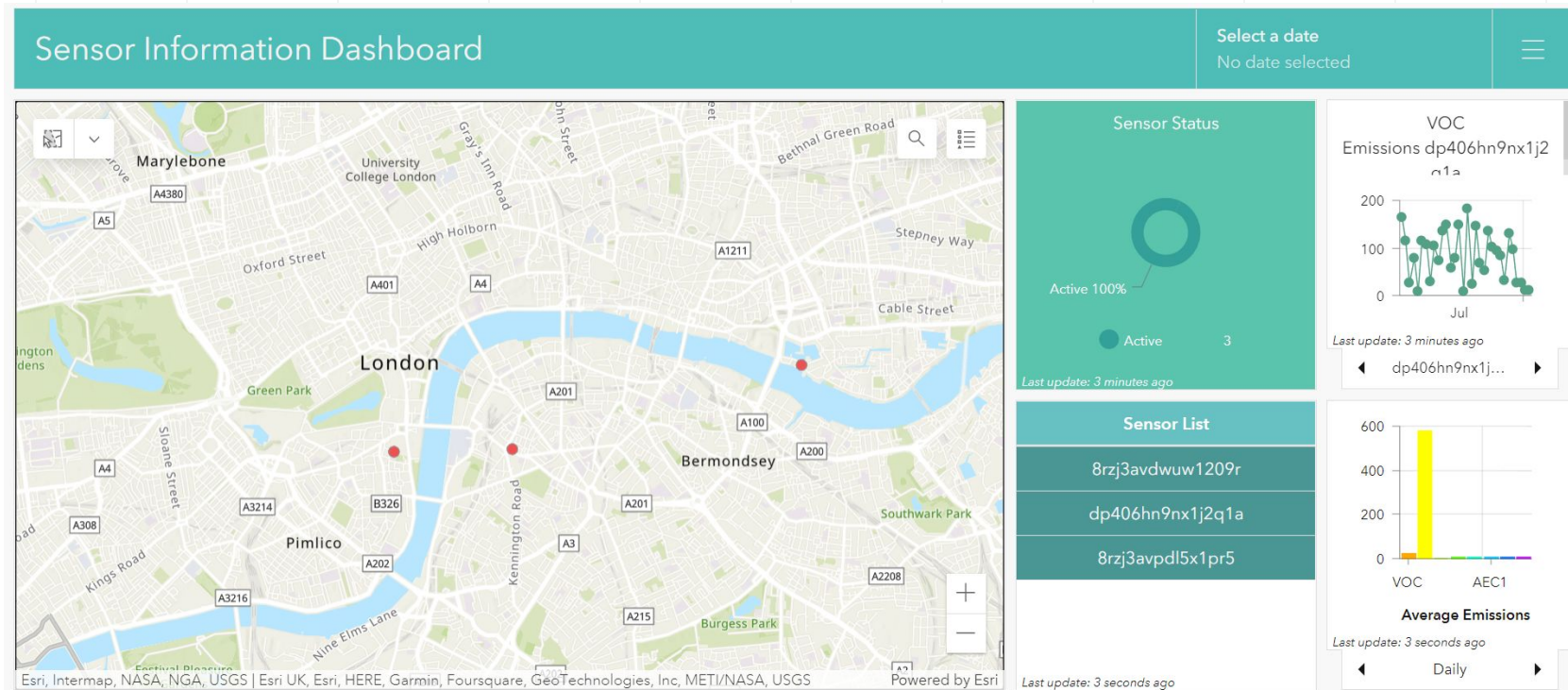


Dashboard Capabilities

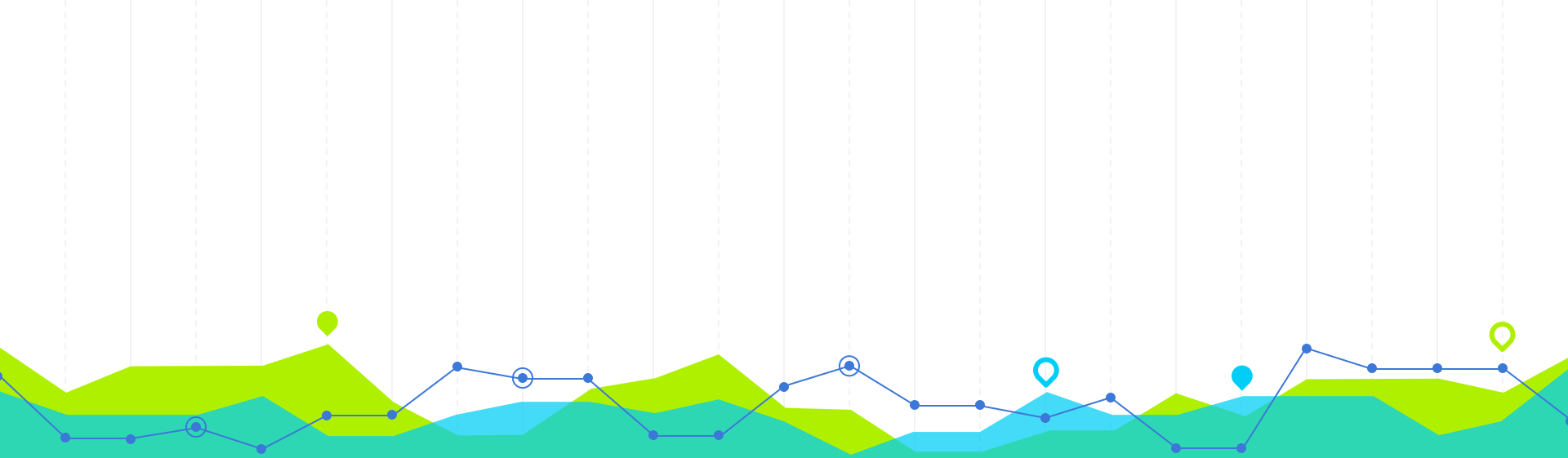
- Serial Chart
- Bar Graph
- Indicators
- List
- Map
- Pie Chart



Dashboard Showcase



<https://nu.maps.arcgis.com/apps/dashboards/6187043fabb5425c884b694333ca444e>



Platforms Team

WEBSITE DEMO:

UI overview and a typical user session

