



WASTE WATCHER

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Demonstration of key features

PROJECT OVERVIEW

- WasteWatcher is an API platform and data visualization web application.
- WasteWatcher serves as a platform for waste management analysis to help address the global warming issue.

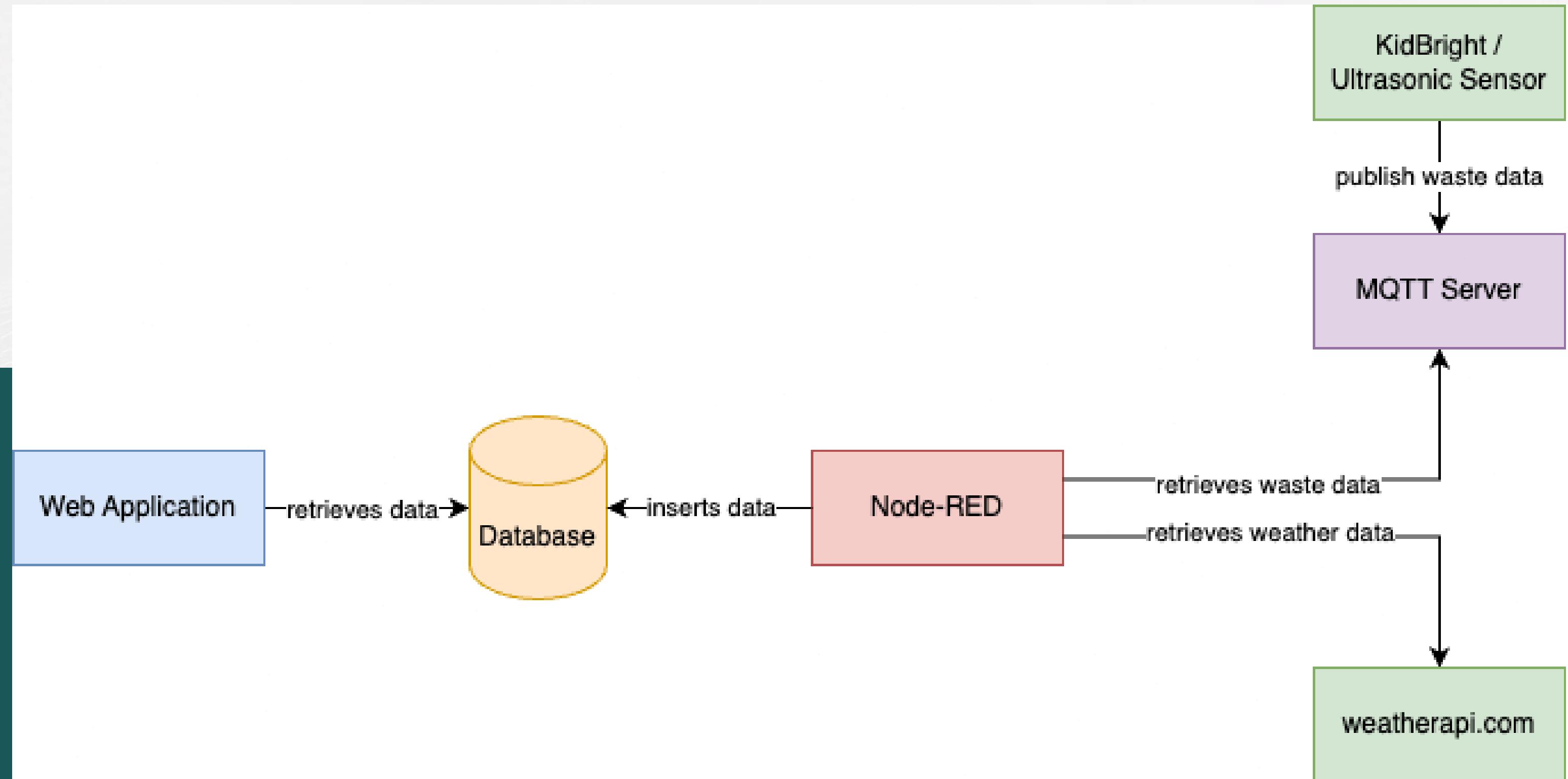


BACKGROUND & MOTIVATION

- The world is currently impacted by global warming, largely due to waste.
- Understanding how weather influences waste generation can lead to solutions for the global waste problem.



OVERALL ARCHITECTURE



PRIMARY DATA SOURCE



Waste level in the bin

- The ultrasonic sensor (HC-SR04) is placed under the bin lid.
- KidBright send the waste level added in the past hour to the MQTT server.
- Node-RED retrieves data from the MQTT server and records it to the database.

SECONDARY DATA SOURCE

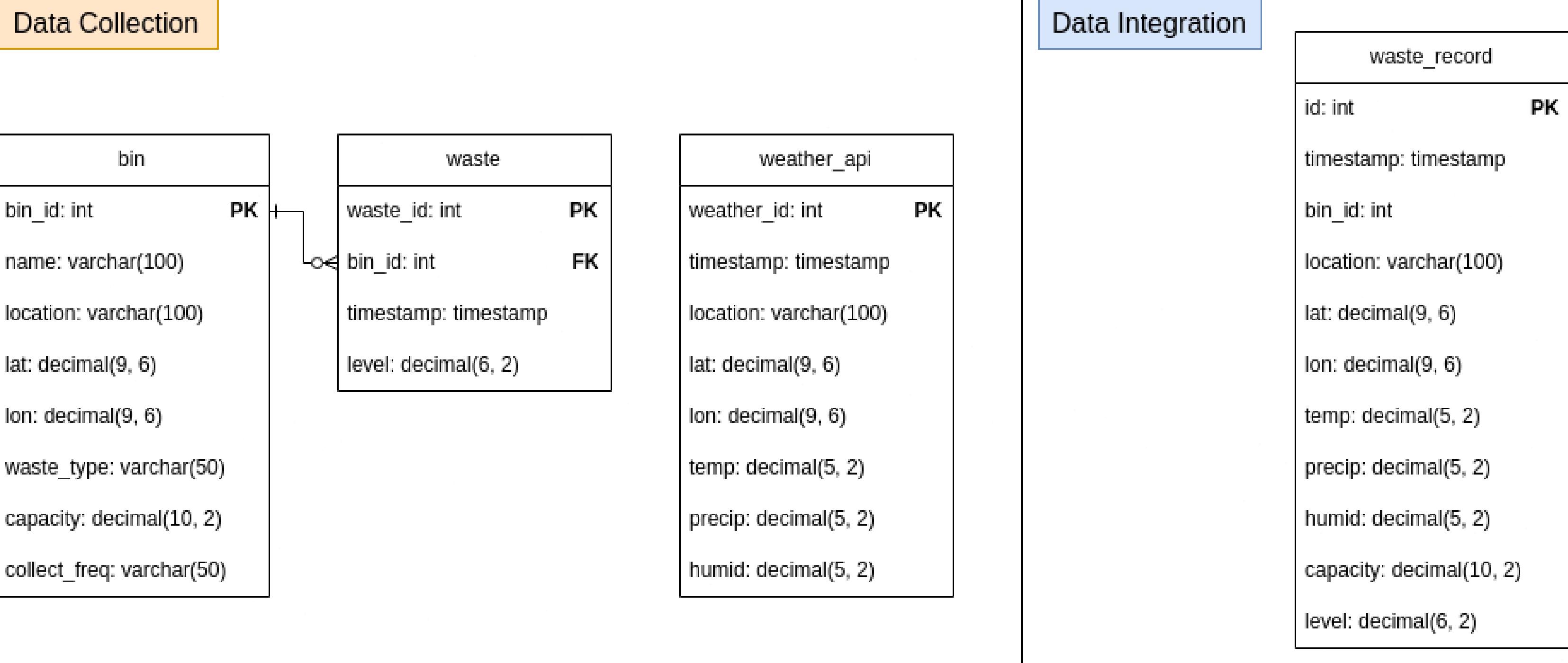


```
{  
  "location": {  
    "name": "London",  
    "region": "City of London, Greater London",  
    "country": "United Kingdom",  
    "lat": 51.52,  
    "lon": -0.11,  
    "tz_id": "Europe/London",  
    "localtime_epoch": 1613896955,  
    "localtime": "2021-02-21 08:42"  
  },  
  "current": {  
    "last_updated_epoch": 1613896210,  
    "last_updated": "2021-02-21 08:30",  
    "temp_c": 11,  
    "temp_f": 51.8,  
    "is_day": 1,  
    "condition": {  
      "text": "Partly cloudy",  
      "icon": "//cdn.weatherapi.com/weather/64x64/day/116.png",  
      "code": 1003  
    },  
    "wind_mph": 3.8,  
    "wind_kph": 6.1,  
    "wind_degree": 220,  
    "wind_dir": "SW",  
    "pressure_mb": 1009,  
    "pressure_in": 30.3,  
    "precip_mm": 0.1,  
    "precip_in": 0,  
    "humidity": 82,  
    "cloud": 75,  
    "feelslike_c": 9.5,  
    "feelslike_f": 49.2,  
    "vis_km": 10,  
    "vis_miles": 6,  
    "uv": 1,  
    "gust_mph": 10.5,  
    "gust_kph": 16.9,  
    "air_quality": {  
      "co": 230.3,  
      "no2": 13.5,  
      "o3": 54.3,  
      "so2": 7.9,  
      "pm2_5": 8.6,  
      "pm10": 11.3,  
      "us-epa-index": 1,  
      "gb-defra-index": 1  
    }  
  }  
}
```

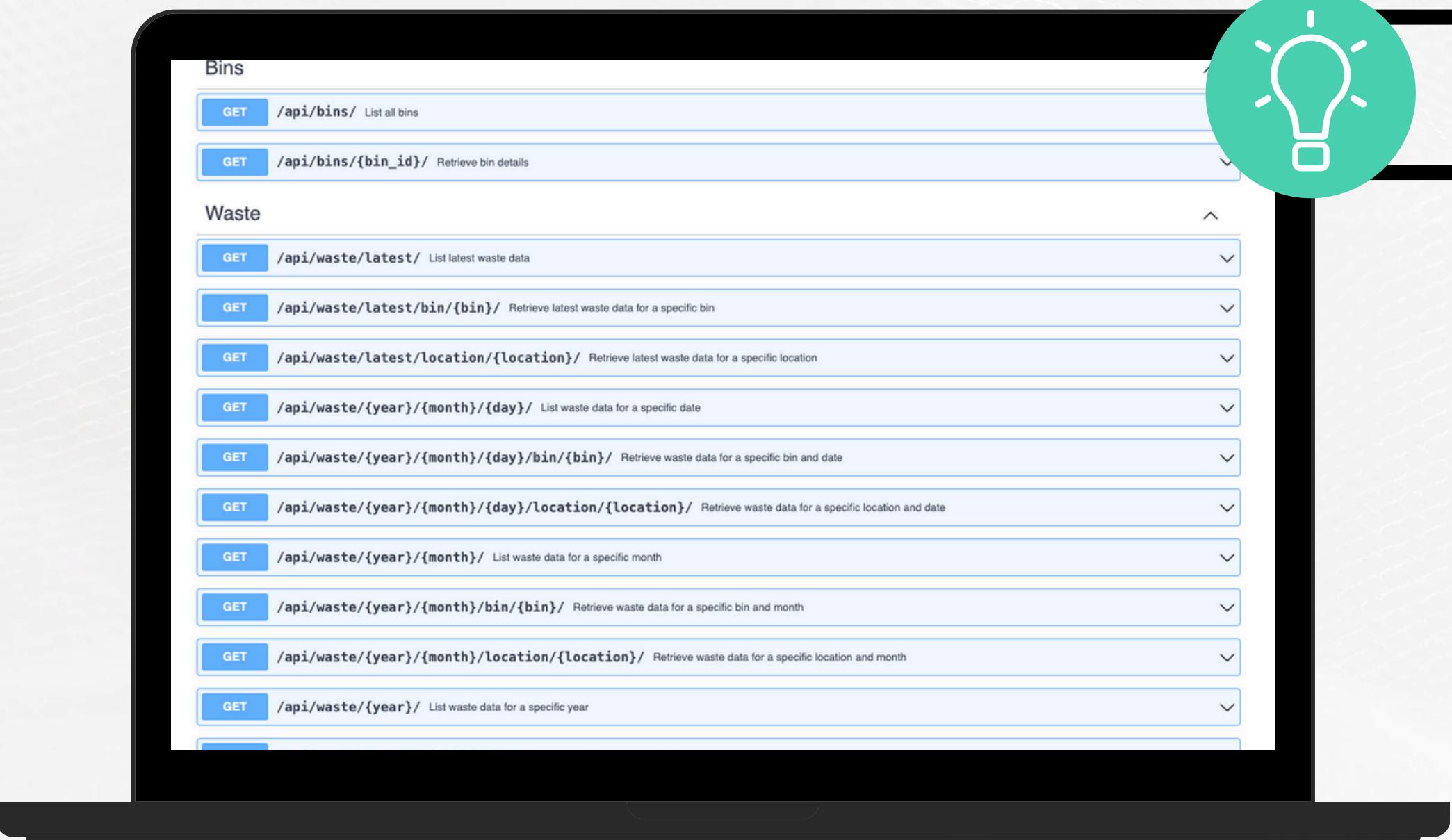
Weather condition data

- Node-RED retrieves weather condition data via API from WeatherAPI.com.
- Node-RED stores the selected data to the database.

DATABASE SCHEMA



DATA SHARING API



BIN, WASTE AND WEATHER DATA

- There are 14 endpoints.
- These endpoints includes retrieving bin information and waste records along with their corresponding weather conditions.

DATA SHARING API

/api/bins/

- Retrieve all bins information

Schema

```
[  
  {  
    "bin_id": 0,  
    "name": "string",  
    "location": "string",  
    "lat": "string",  
    "lon": "string",  
    "waste_type": "string",  
    "capacity": "string",  
    "collect_freq": "string"  
  }  
]
```

Actual data

```
[  
  {  
    "bin_id": 1,  
    "name": "Jullaphong House",  
    "location": "Thanyaburi",  
    "lat": "14.003589",  
    "lon": "100.695032",  
    "waste_type": "general",  
    "capacity": "35.00",  
    "collect_freq": "daily"  
  },  
  {  
    "bin_id": 2,  
    "name": "Phimnada House",  
    "location": "Lam Luk Ka",  
    "lat": "13.885775",  
    "lon": "100.649384",  
    "waste_type": "general",  
    "capacity": "42.50",  
    "collect_freq": "daily"  
  }  
]
```

DATA SHARING API

/api/waste/latest/

- Retrieve latest waste data

Schema

```
[  
  {  
    "bin": 0,  
    "total_waste": 0,  
    "min_temp": 0,  
    "max_temp": 0,  
    "avg_temp": 0,  
    "min_precip": 0,  
    "max_precip": 0,  
    "sum_precip": 0,  
    "min_humid": 0,  
    "max_humid": 0,  
    "avg_humid": 0  
  }  
]
```

Actual data

```
[  
  {  
    "bin": 2,  
    "total_waste": 14.04,  
    "min_temp": 31,  
    "max_temp": 38,  
    "avg_temp": 33.146154,  
    "min_precip": 0,  
    "max_precip": 0,  
    "sum_precip": 0,  
    "min_humid": 45,  
    "max_humid": 79,  
    "avg_humid": 65.846154  
  }  
]
```

DATA SHARING API

/api/waste/{year}/{month}/location/{location}/

- Retrieve waste data for a specific location and month

Schema

```
{  
  "location": "string",  
  "year": 0,  
  "month": 0,  
  "records": [  
    {  
      "datetime": "string",  
      "bin": 0,  
      "level": "string",  
      "temp": 0,  
      "precip": 0,  
      "humid": 0  
    }  
  ]  
}
```

Actual data

```
{  
  "location": "Thanyaburi",  
  "year": 2024,  
  "month": 4,  
  "records": [  
    {  
      "datetime": "2024-04-21T10:00:00Z",  
      "bin": 1,  
      "level": 0,  
      "temp": 34,  
      "precip": 0,  
      "humid": 41  
    },  
    {  
      "datetime": "2024-04-21T09:00:00Z",  
      "bin": 1,  
      "level": 0,  
      "temp": 34,  
      "precip": 0,  
      "humid": 47  
    },  
    {  
      "datetime": "2024-04-21T11:00:00Z",  
      "bin": 1,  
      "level": 0,  
      "temp": 34,  
      "precip": 0,  
      "humid": 43  
    }  
  ]  
}
```

DATA VISUALIZATION



TREND OF WASTE LEVEL AND WEATHER CONDITION

- Interactive visualization on the trend of waste level and weather condition throughout the time.
- Provide insights into the relationship between waste generation and weather conditions.

DEMONSTRATION



THANK YOU

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