

An isometric illustration of a city. The top half shows a dense urban area with tall, modern skyscrapers in shades of blue and grey. A large, dark, billowing cloud of smoke or pollution rises from the buildings on the left. A multi-lane road with a red double-decker bus and a white car runs diagonally through the scene. The bottom half shows a more varied urban landscape with smaller, colorful buildings (red, orange, blue), green parks with trees, and a street intersection with a pink car. The overall style is a clean, stylized isometric perspective.

CITY MICROCLIMATE AND TRAFFIC ANALYSIS

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OPERATIONS



Accurate microclimate forecasts and predictions by combining meteorological data from open APIs with real and virtual local weather data from sensors.



Calculation of the correlation index between traffic data and various microclimate parameters (such as wind, rain amount and temperature) depending on the point of interest under study.



UI visualization of heatmaps and graphs indicating the progression of traffic versus key microclimate parameters' alternations.

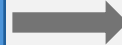


Alerts and warning reports concerning slippery roundabouts caused by severe rainfall, dangerously windy bridges, road closures due to flood or fallen trees and frozen roads because of snow.

Requirements

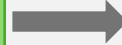
Resources

Accurate microclimate data in specific locations



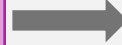
Numerous environmental sensors, sparsely located

Data ingestion



MQTT, HTTP

Historical environmental and traffic data



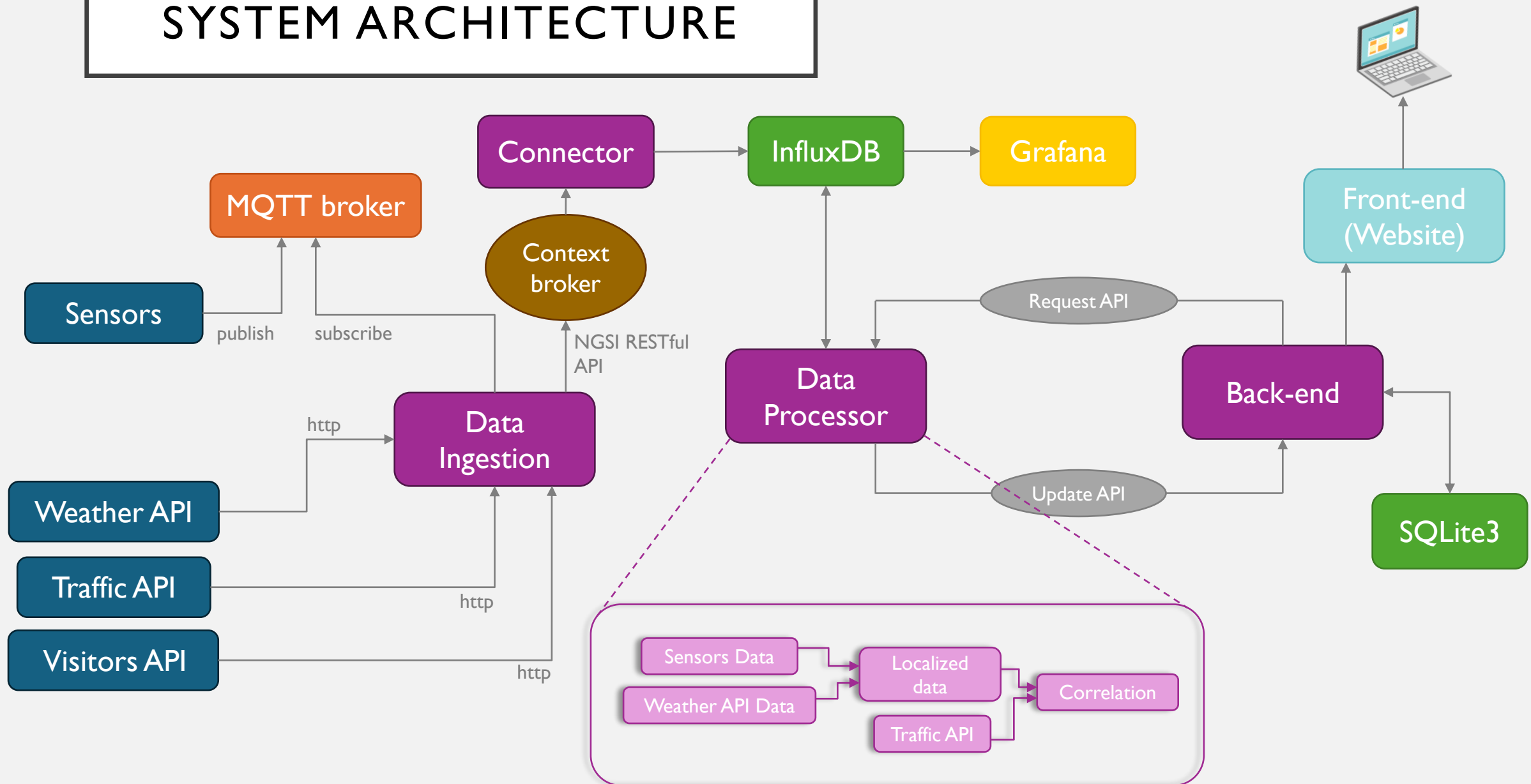
Data Bases

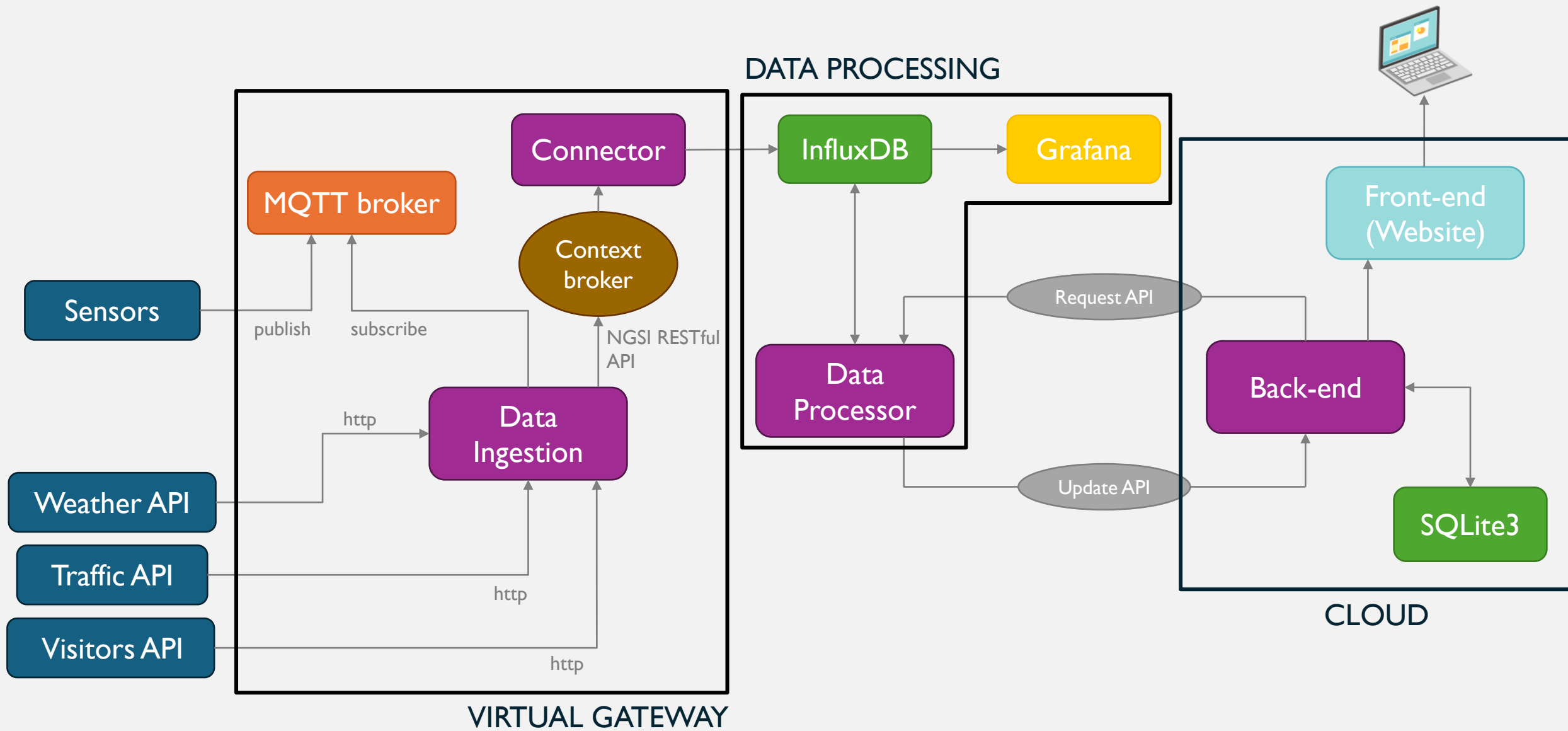
High availability of collected data and system future scalability



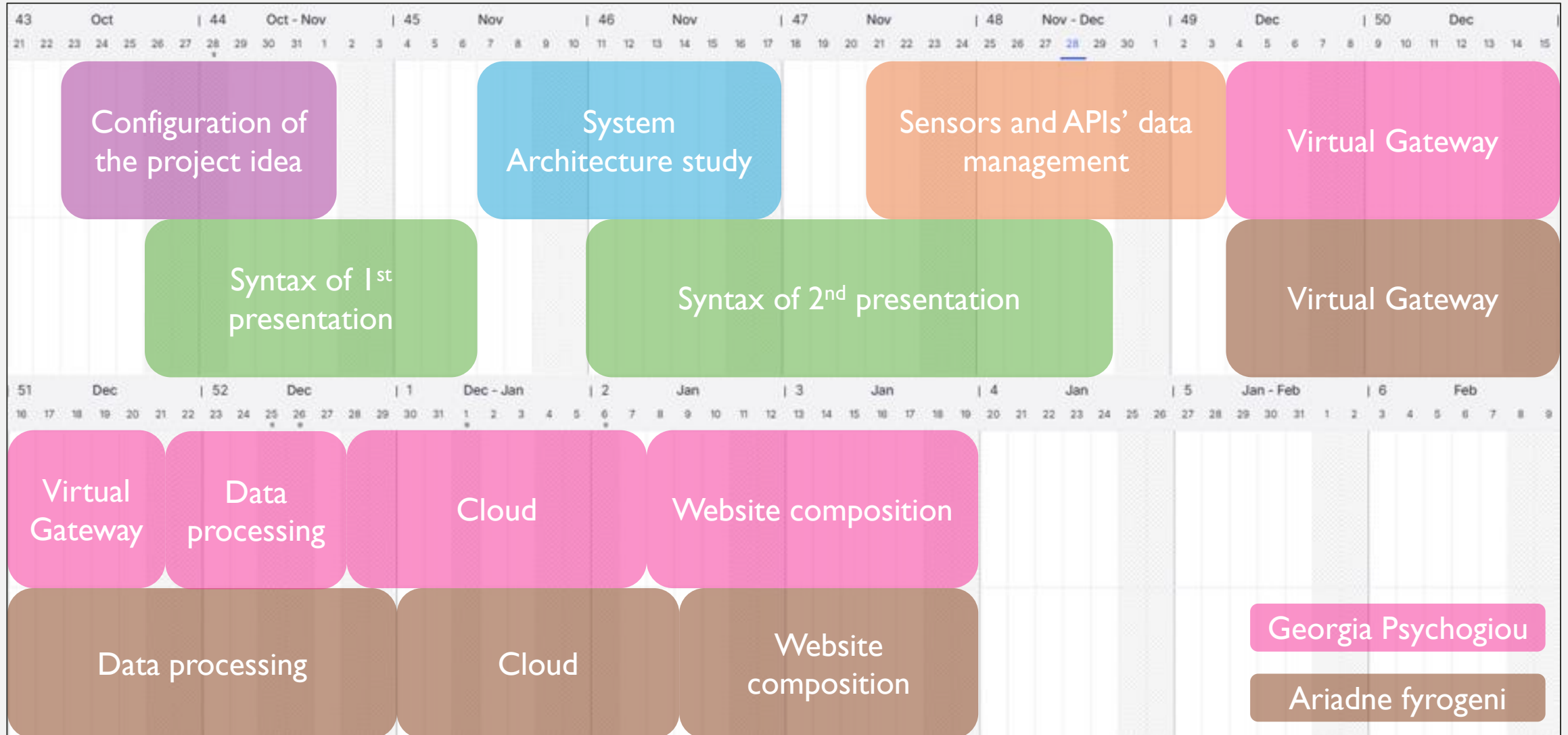
FIWARE context broker

SYSTEM ARCHITECTURE





WORK SCHEDULE



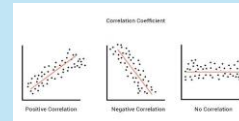
TECHNOLOGIES - TOOLS

Python



JavaScript

Pearson Correlation



Open Weather
Map



Tom Tom



Fiware

Grafana



GitHub



Figma

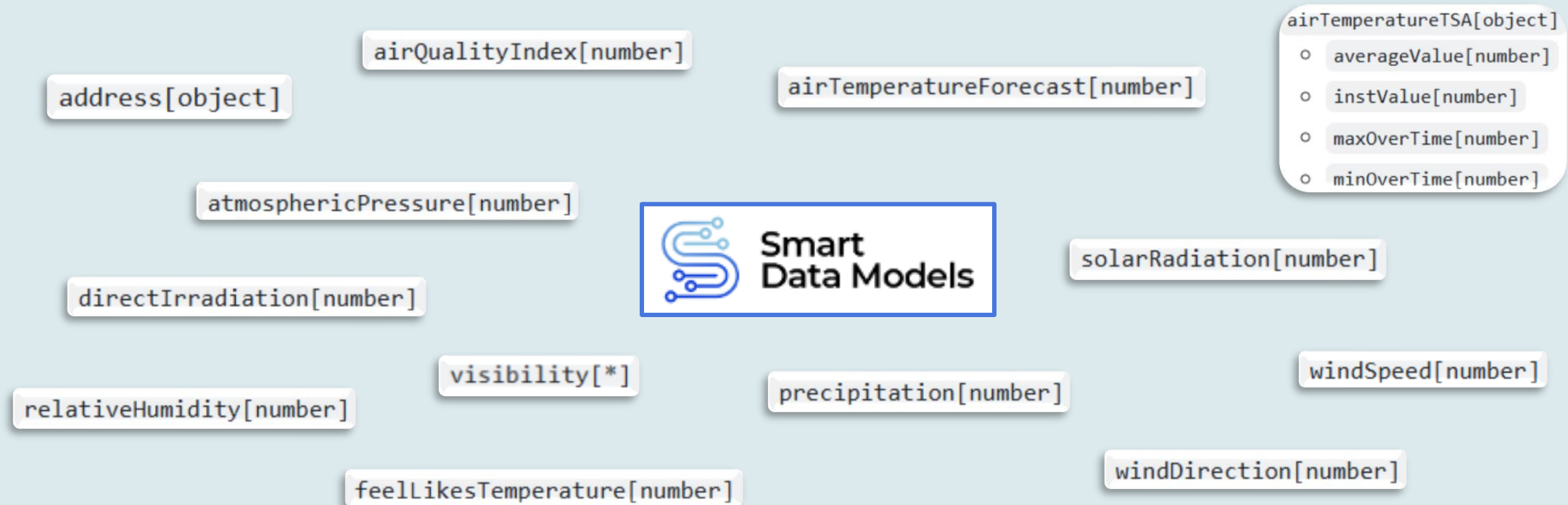
TOM-TOM API

```
data > traffic_data > {} tom_tom_traffic_data.json > ...
1  {
2    "flowSegmentData": {
3      "frc": "FRC3",
4      "currentSpeed": 13,
5      "freeFlowSpeed": 18,
6      "currentTravelTime": 484,
7      "freeFlowTravelTime": 350,
8      "confidence": 0.771698,
9      "roadClosure": true,
10     "coordinates": {
11       "coordinate": [
12         {
13           "latitude": 38.244489137915444,
14           "longitude": 21.722256524668145
15         }
16       ]
17     },
18     "@version": "traffic-service-flow 1.0.120",
19     "trafficPercentage": 0.28
20   }
21 }
22
```

$$\text{Traffic Percentage} = \frac{\text{Free Flow Speed} - \text{Current Speed}}{\text{Free Flow Speed}}$$

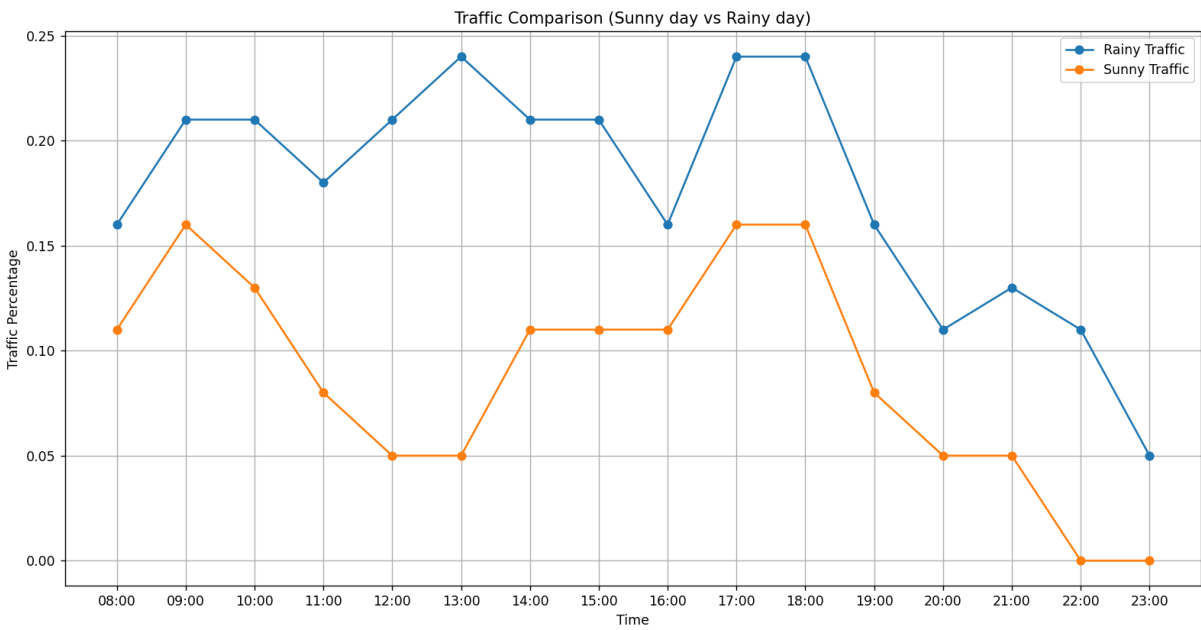
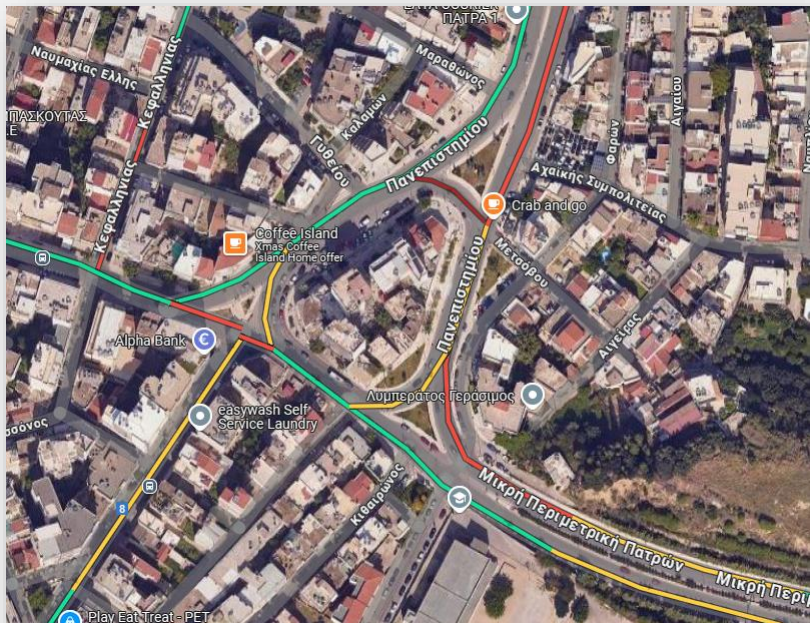
```
# Run the functions to fetch and save data
fetch_traffic_flow()
fetch_traffic_incidents()
```

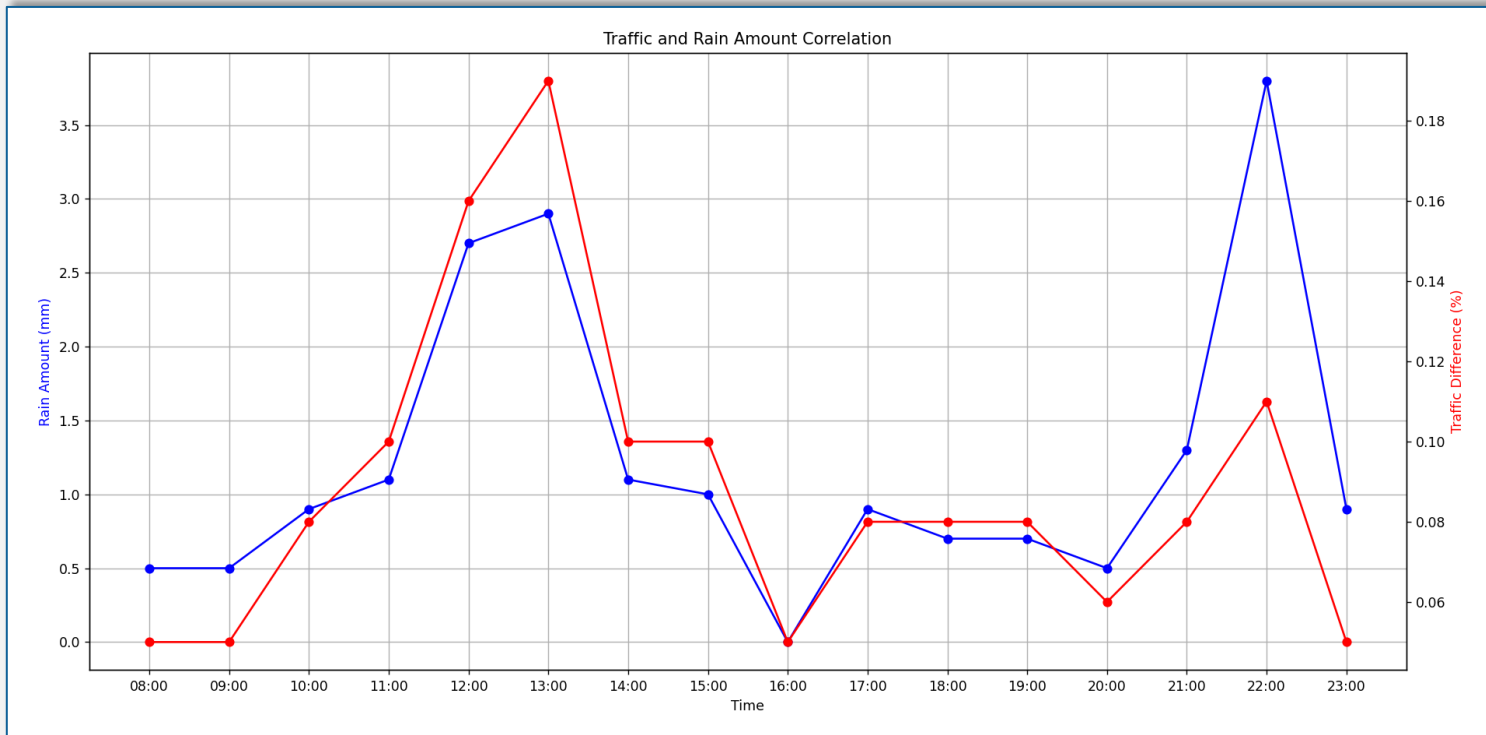

SMART DATA MODEL



<https://github.com/smart-data-models/dataModel.Weather/blob/master/WeatherObserved/doc/spec.md>

DEMO





MICROCLIMATE AND TRAFFIC CORRELATION

```
44 # Correlation calculation
45 def calculate_correlation(list1, list2):
46     if len(list1) != len(list2):
47         raise ValueError("Lists must have the same length for correlation calculation.")
48     correlation, p_value = pearsonr(list1, list2)
49     return correlation, p_value
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

Correlation index between rain and traffic: 0.79
P-value: 3.05e-04

THANK YOU!

Any questions?