Design and implementation of the core level of a cross-platform based on Fog Computing

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About me

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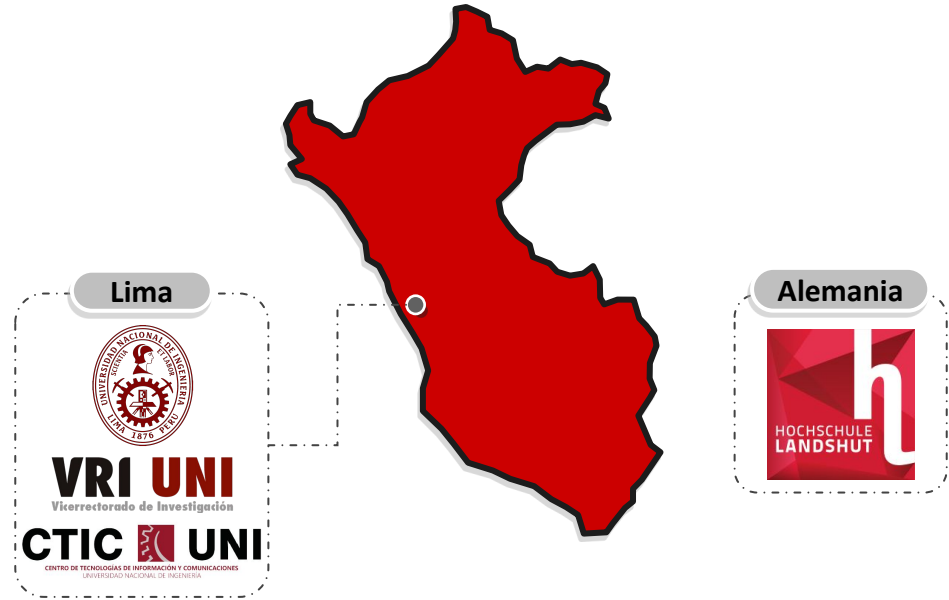
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Context & Motivation

How to integrate multiple data sources?

Context

We identify the necessity of implement a real-time system to collect and process data:

- Sensor information
- Real-time data
- Dashboard

Motivation

The motivation for which this theme was decided is due to the huge amount of software, libraries and frameworks that carry out this work using other technologies to obtain and update in a certain time (it could be time real), in addition to the great need for software that provides information in a friendly and easy-to-use manner.

UNI | FC

Key contributions

- We **propose** a **methodology to analyze income data** from remote sensors.

- We **implement a Full Stack application** to process, clean, and show information sensed

- We **develop a dashboard to show** information in real-time.

- We **build an Fog-based architecture to sensing**, process, and track sensors data from different locations in real-time.
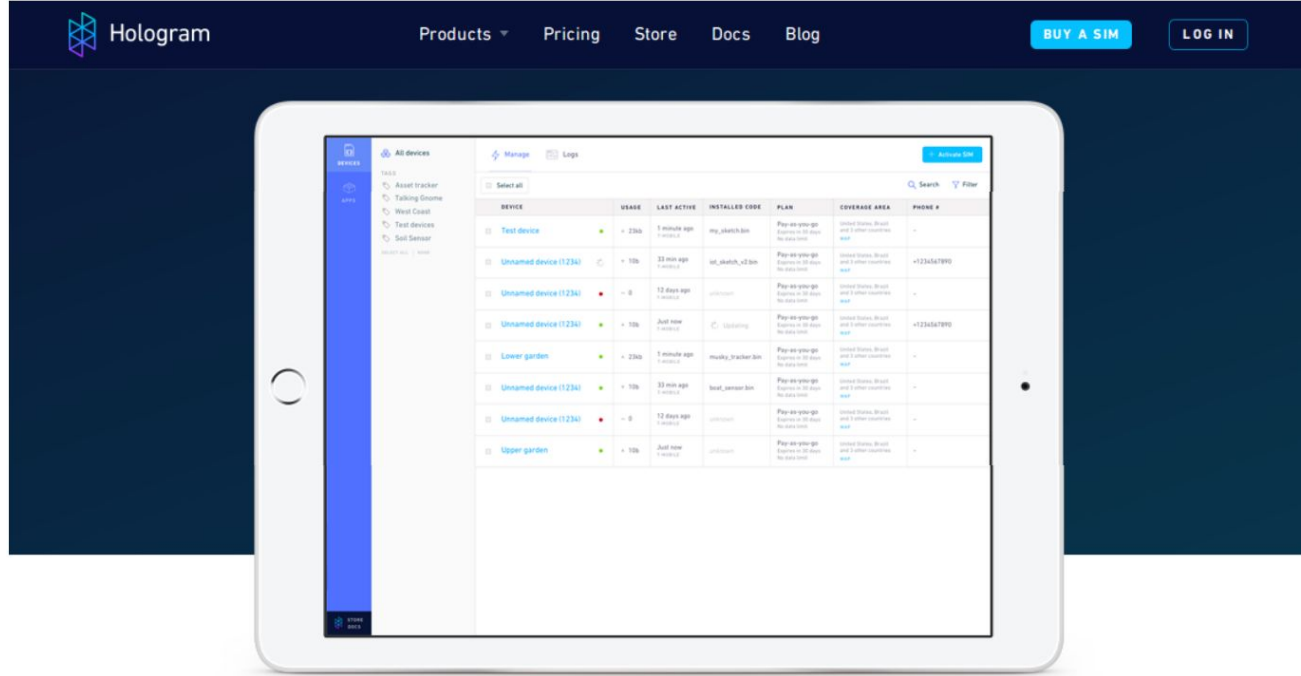
Related Works

ClearBlade
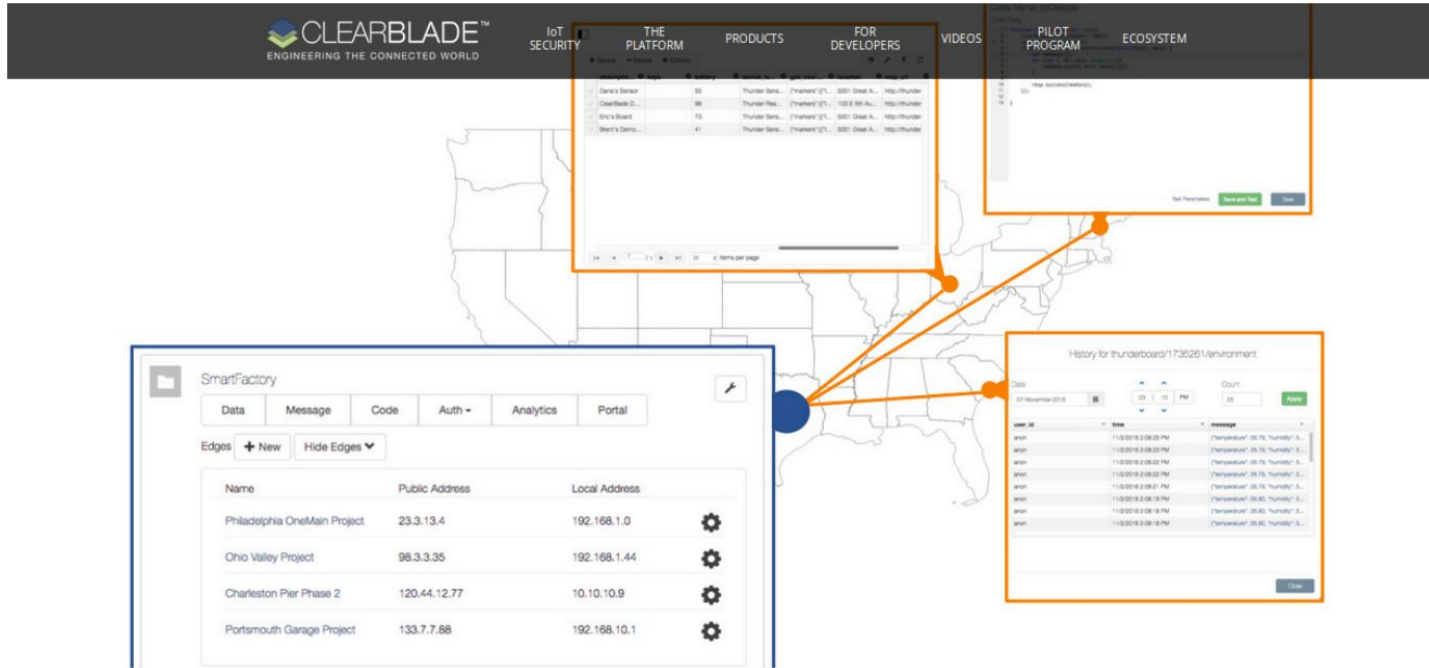
It is a web platform software which provides services on IoT using the MQTT protocol and SDK of development, it will notify you about changes (on off, data, connectivity) in the associated devices, that is, ClearBlade works as a Socket MQTT web broker.
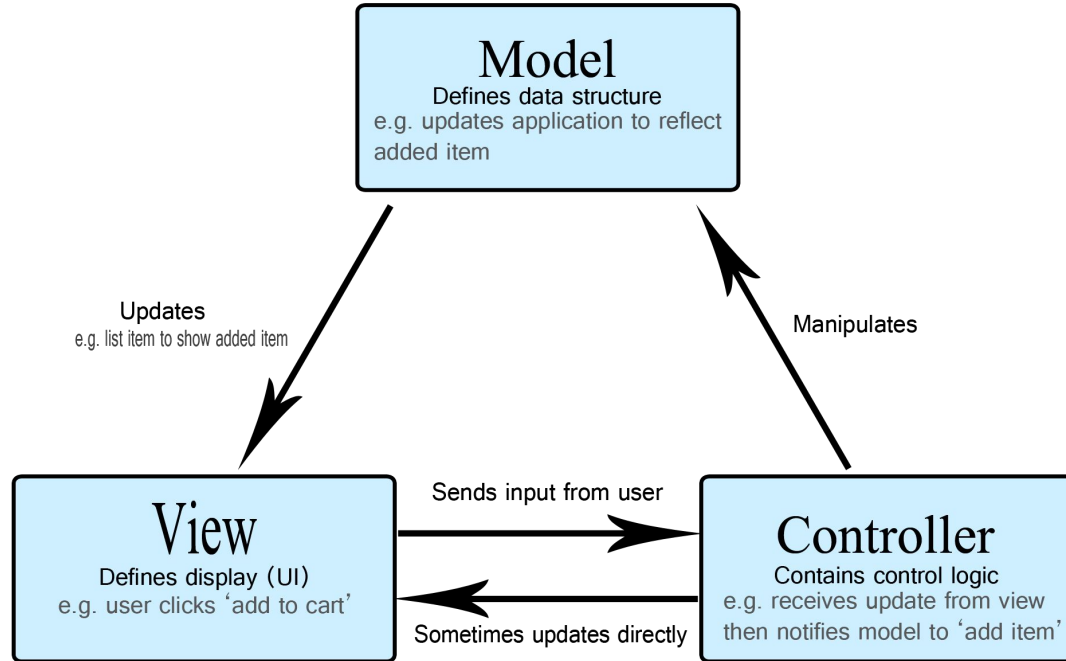
Hologram

It is a web platform software which provides services storage and connectivity such as bluetooth, wifi, and GSM, which they send it to their web platform, storing it for subsequently display the information obtained in your dashboard.
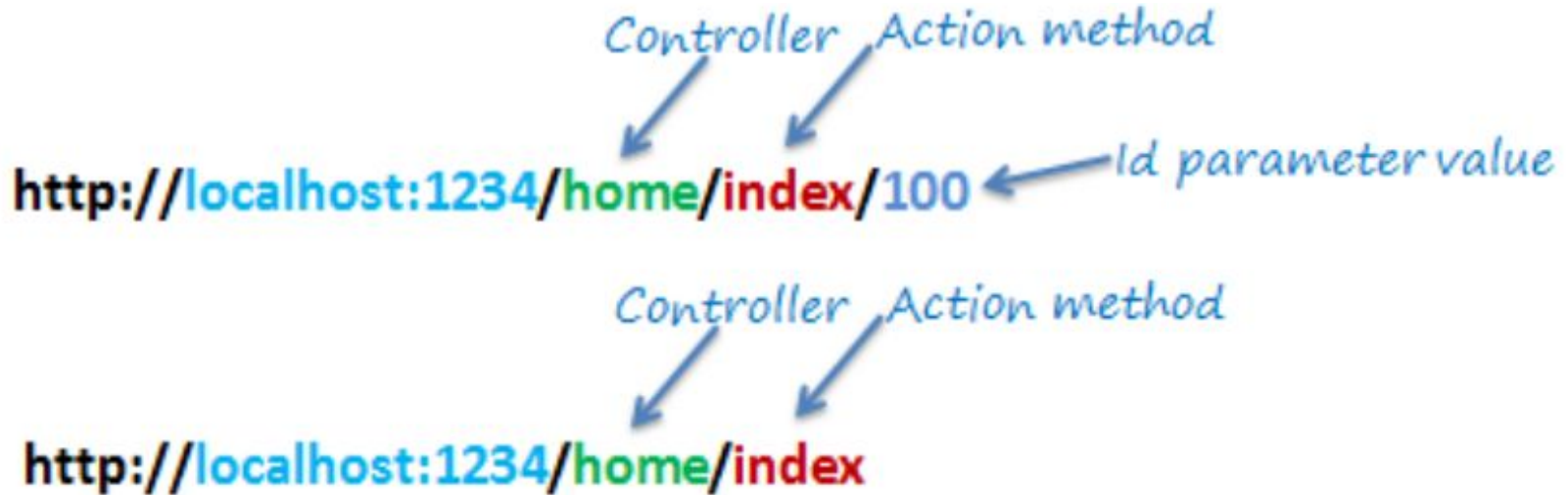
Technologies

Model-View-Controller (MVC)

The pattern of development on which the design of the implementation of the web platform is MVC (model-view-controller).

HTTP: Routing in MVC

Controller   Action method

http://localhost:1234/home/index/100   Id parameter value

Controller   Action method

http://localhost:1234/home/index

For the development of a platform, a library, a package or a project in general, it is best to save the modifications or corrections of errors as they appear during the implementation stage.
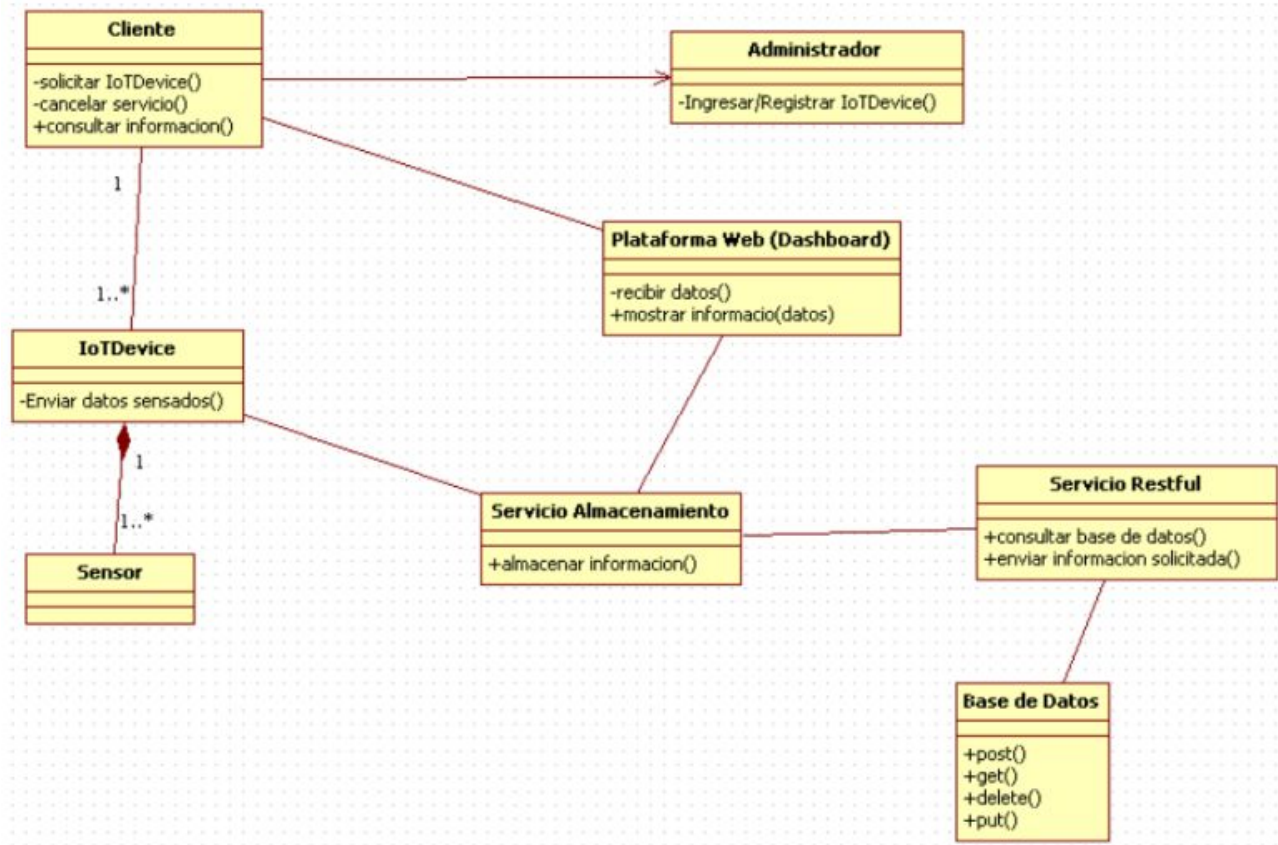
MQTT: Message Passing
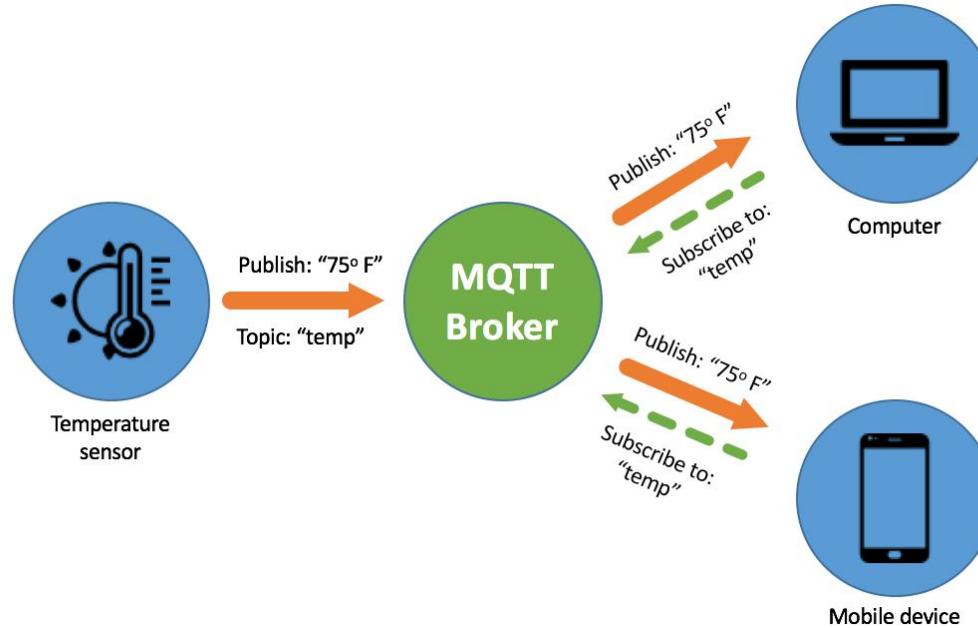
It is an object-oriented design pattern, where objects to a class instead of the class itself instantiating the object, used for web application implementation making calls to various components necessary for the functioning.
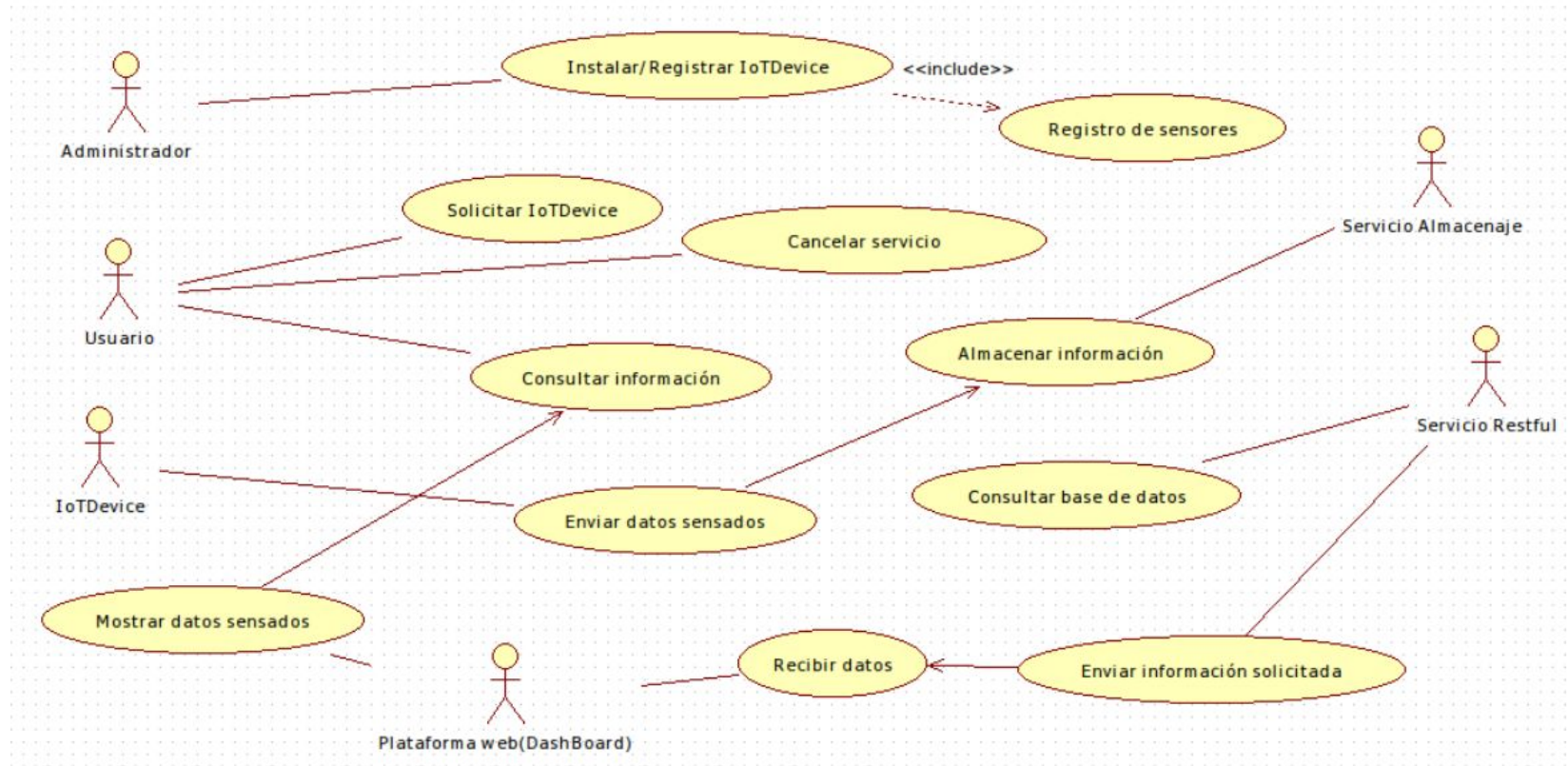
System Analysis

Definitions

- **Administrator** It is the actor in charge of the administration of the users. He is the only user who does not have IoT-Device registered.

- **User** It is the actor that has requested a service to the system, it is that is, it is aware of the sensed information displayed by the system depending on the devices that the same user have requested.

- **IoTDevice** It is the actor that sends the information that it captures from the sensors and sends them to the storage actor.

- **Dashboard** It is the actor in charge of displaying the information sensed and stored.

- **Restful** It is the actor that is in charge of performing and returning answers according to the requests of the actor dashboard, as well as also check the storage.

- **Storage** It is the actor in charge of storing the information
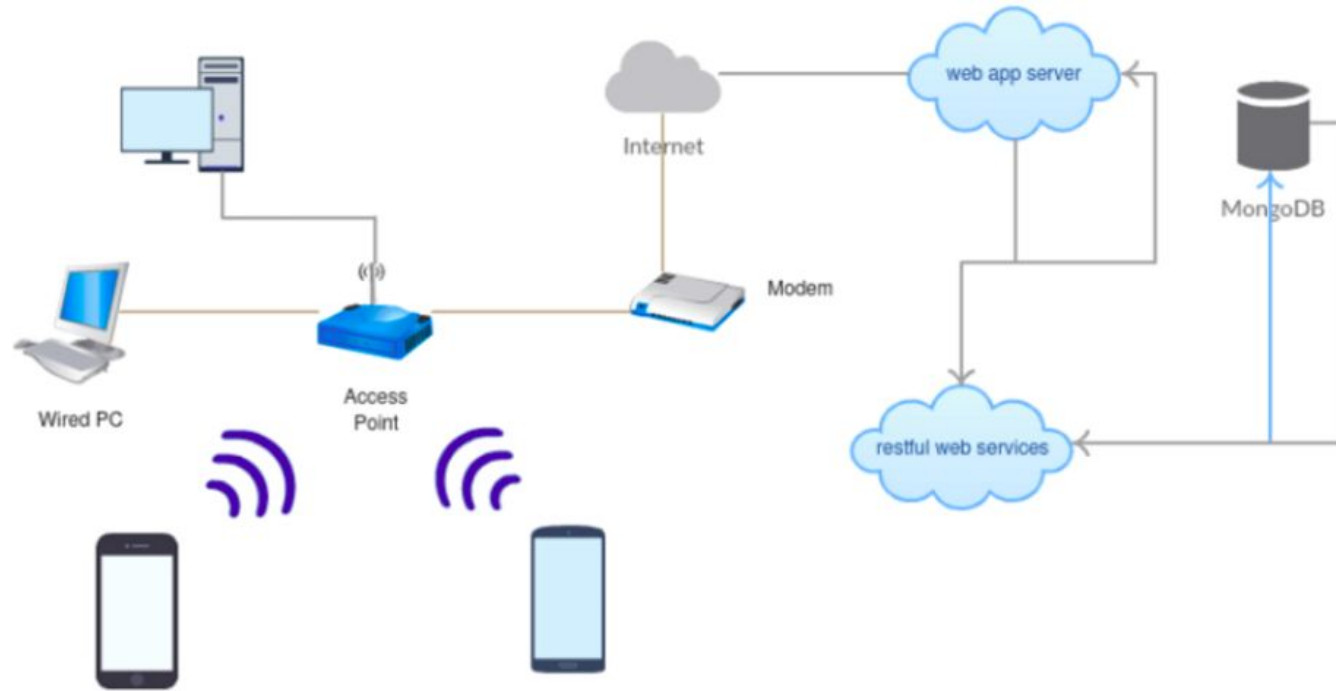
Classes diagram

Case study diagram

Web Application

Fog architecture

Device information
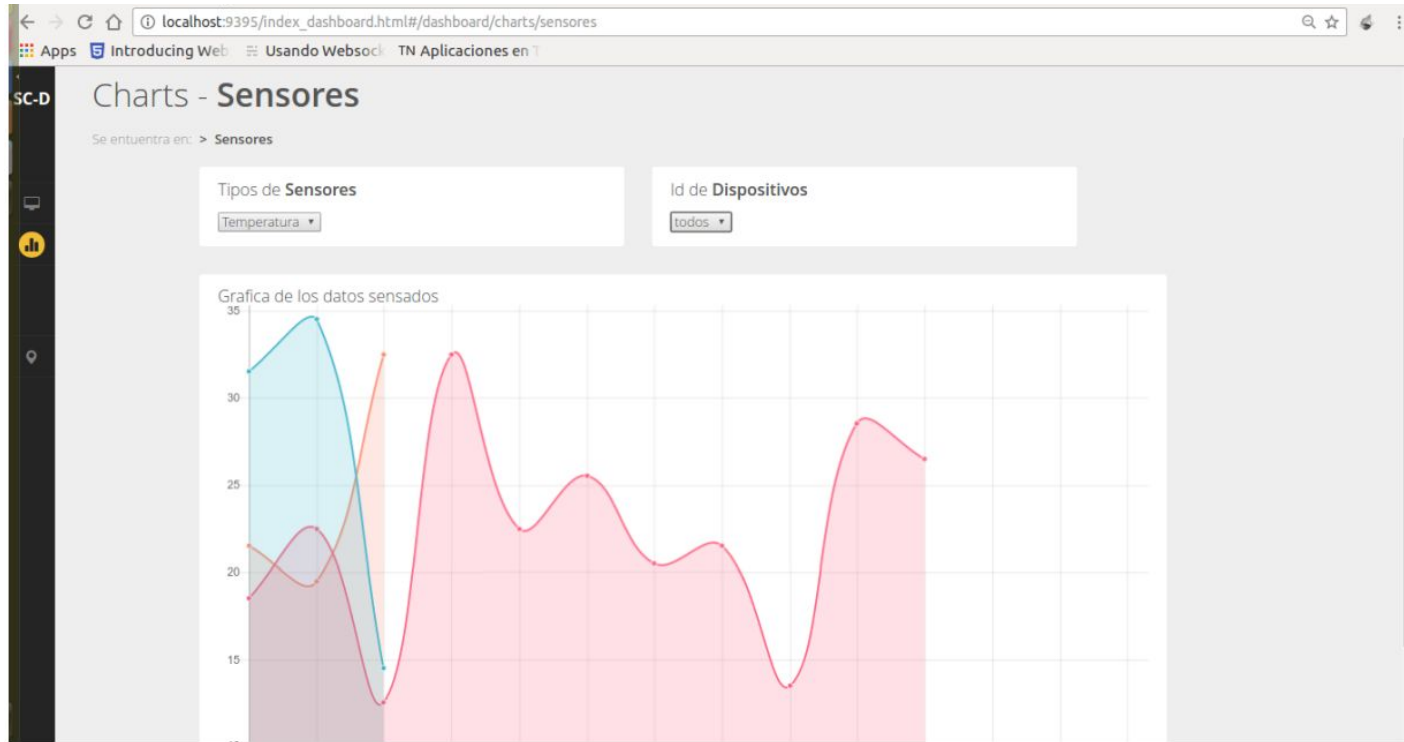
Device-sensors information

lista de **Sensores**

Se entuentra en: > Sensores Info

Datos de **Sensores**
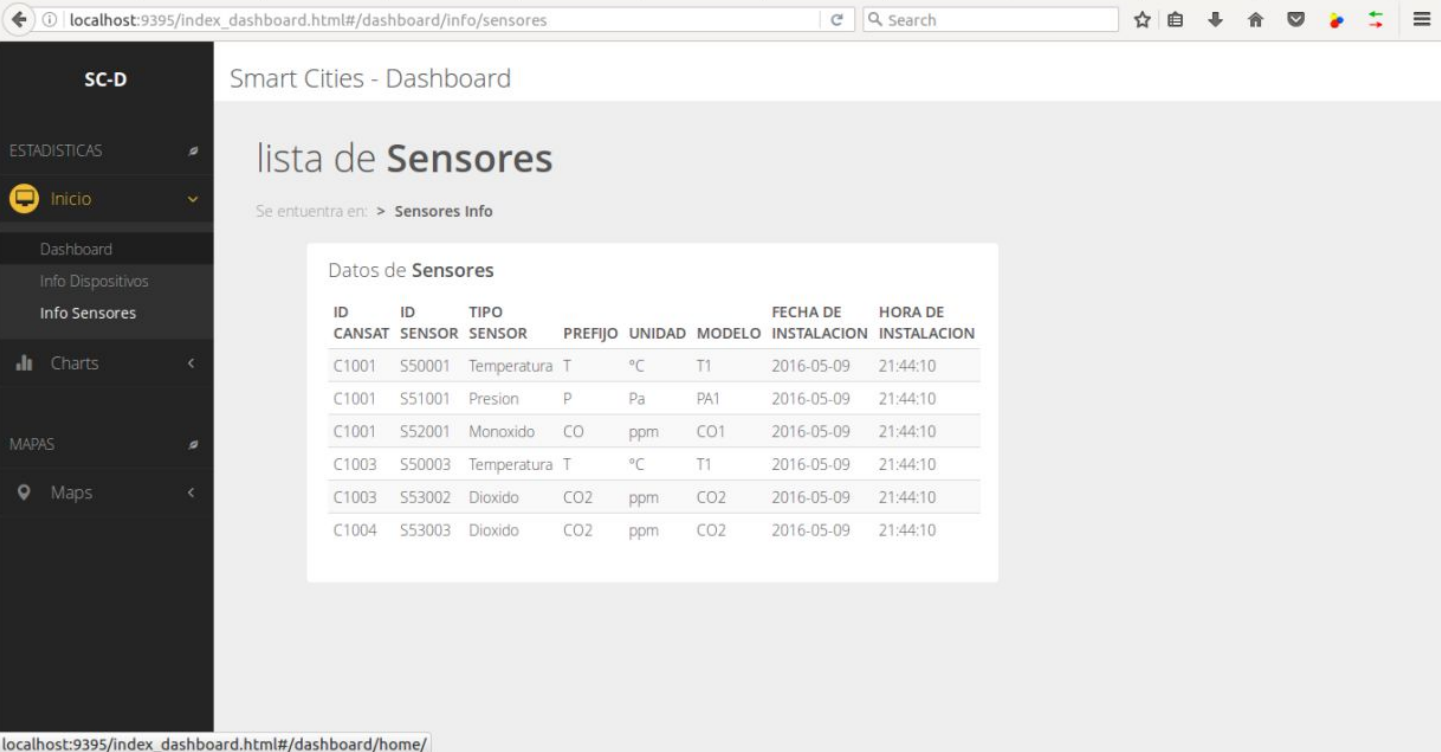
| ID CANSAT	ID SENSOR	TIPO SENSOR	PREFIJO	UNIDAD	MODELO	FECHA DE INSTALACION	HORA DE INSTALACION
C1001	S50001	Temperatura	T	°C	T1	2016-05-09	21:44:10
C1001	S51001	Presion	P	Pa	PA1	2016-05-09	21:44:10
C1001	S52001	Monoxido	CO	ppm	CO1	2016-05-09	21:44:10
C1003	S50003	Temperatura	T	°C	T1	2016-05-09	21:44:10
C1003	S53002	Dioxido	CO2	ppm	CO2	2016-05-09	21:44:10
C1004	S53003	Dioxido	CO2	ppm	CO2	2016-05-09	21:44:10

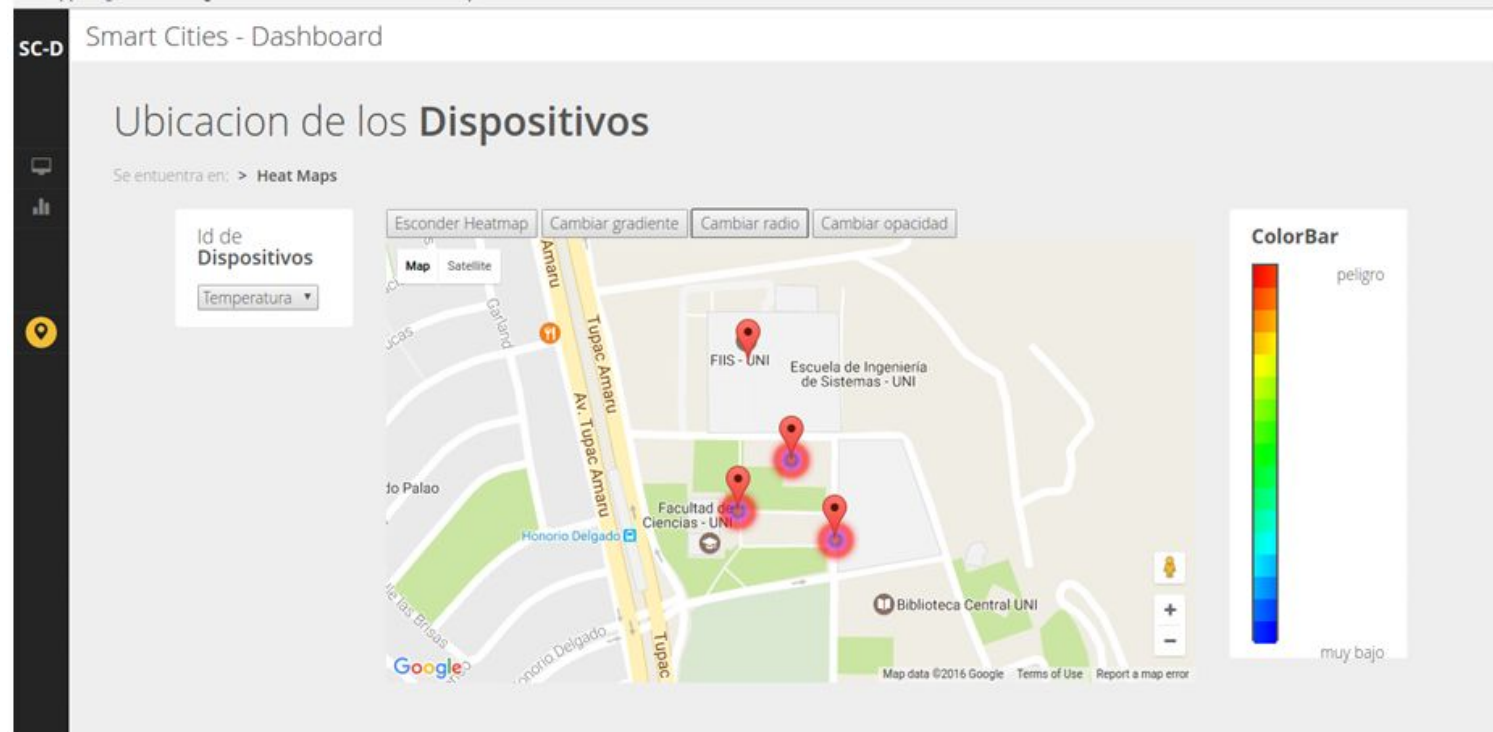# Device-sensors-type information

Sensor data
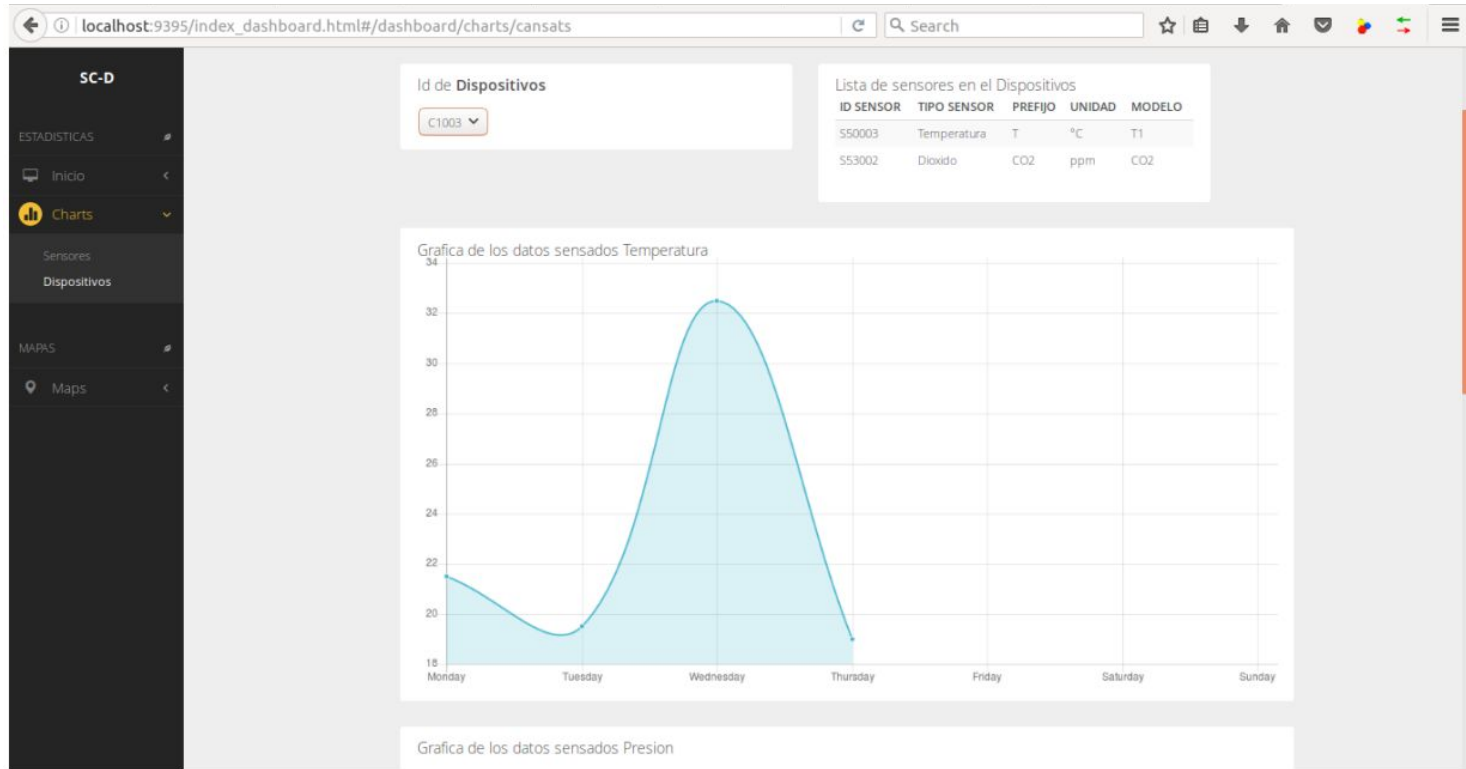
Sensor locations
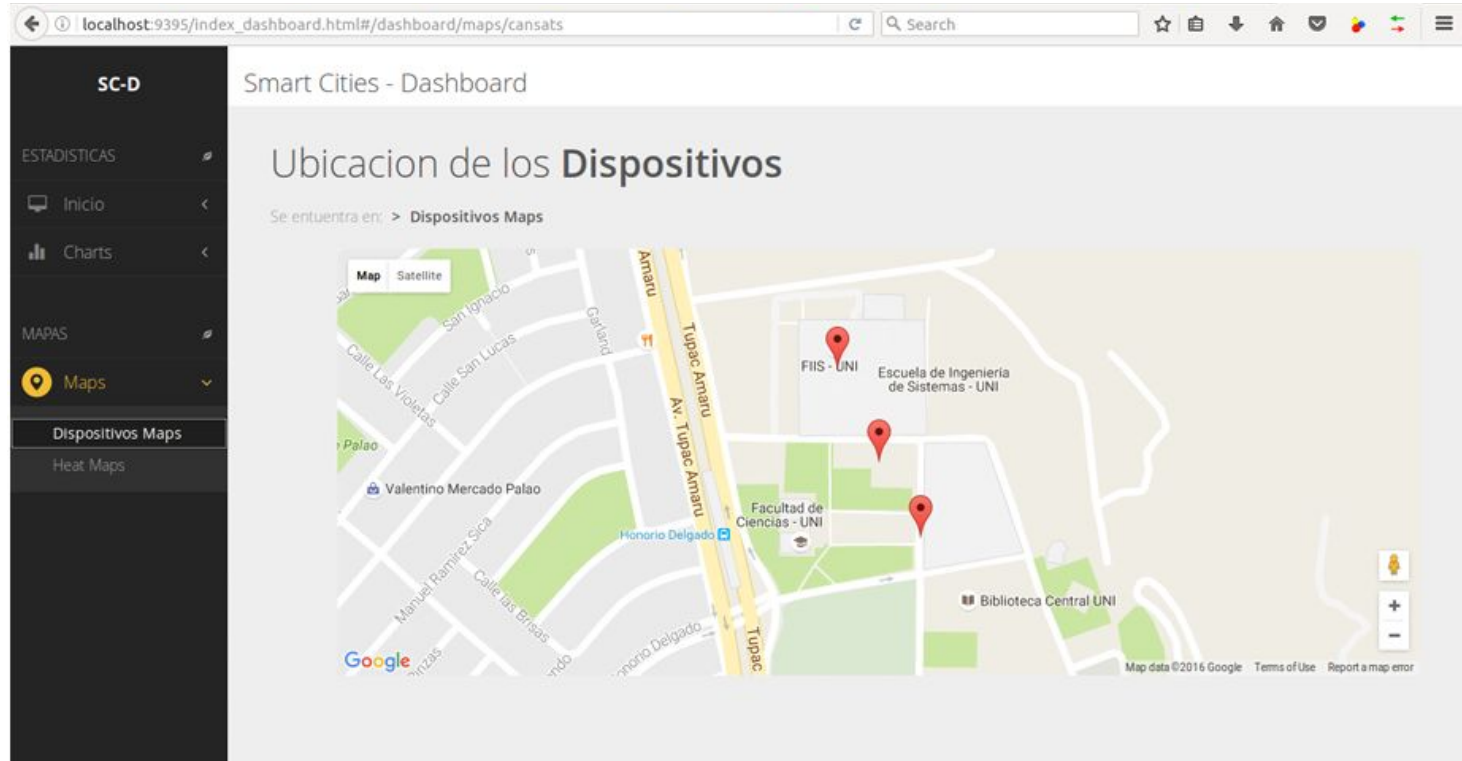
Sensor heatmaps

Conclusions

Conclusions

- We were able to **design a fog architecture** to sensing information from remote devices.
- It is feasible to **implement middlewares** to process and clean information from remote devices.
- **Fog layer** helps to to **reduce the workload** of many devices.
    - It performs better than one central server such as cloud architectures.
    - We won't be able to test high network traffic in our tests, due to the lack of memory and RAM in our computers.

- It has **high availability** in receiving and processing sensor data in different formats, it is possible to **analyze** numerical values and create a real-time system for tracking.

Thanks! Any questions?

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THANKS!