Internals of Application Server

IOT Platform: Sensor Manager & Data Binding

Team Design Document

Team 1 (Group 5)

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Overview

Introduction

Sensor Manager is the part of the Distributed Application Deployment platform which will be mainly responsible for collecting and maintaining the data generated from various sensors fitted on IoT devices. This data will be provided to the applications that are deployed on the platform for analyses and processing.

It will mainly provide various APIs to the application developers for accessing the sensor data directly in their algorithms. The application deployer will be able to register the types of sensor required by the application and then install as many instances of those sensors as required by the application. The data will be entirely managed and scaled by the Sensor Manager thus freeing the developers from hassle of dealing with the sensors and hence provide an easy way for developing and deploying IoT applications with minimal effort.

Scope

Our platform provides various microservices which will facilitate application development. Communication module will provide useful APIs to integrate independent applications on it. All the communication is done by kafka and the sensor will produce the data on the message queue.

Intended Use

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- The intent of having Sensor Manager as an independent module is to mainly separate the complications of handling sensor data that is generated continuously.
- By having a separate module to deal with adding new sensors, managing data generated by them and then supplying it whenever required reduces the load and isolates the complication to a separate module

Assumptions and Dependencies

The assumptions mainly involve,

- The application knows the sensors required for it to run and always asks for the data for the correct sensors.
- At the time of registration full details of sensor information model is available to the user.

System Features and Requirements

Functional Requirements

Sensor Manager Initialiser

- For initialising the sensor manager and setting it up for the further communication with other modules and sensor instances
- After initialisation sensor registration, sensor installation and APIs to get sensor data and controller function would be available for use.
- The sensor manager will be ready to manage sensor data using kafka

Registering Sensors

- New sensors required for the application can be registered on the platform via '/new-sensor' api exposed by this module
- The sensor information model will be validated by sensor manager and will be added to sensor repository if not already present in it.

Installing Sensors

- After registering sensor types its multiple instances can be installed on the platform using '/install-sensor' api
- The installed sensor instances are added in sensor registry of the platform
- After installation the data generated by the sensor instance will be available for use within seconds after installation by any application on the platform

Interaction with IOT sensors

- Sensor Manager will expose the APIs required for sensor registration/installation as well as for providing sensor data required by the application and to handle the controllers.
- It will generate unique topic ids for the sensor instances and pass it on to the data binding submodule for creating a kafka topic on which the data of that sensor instance will be stored.
- It will make sure how the data is being sent to the application and control the data rate as well.
- It is also responsible for consuming the data from the kafka topics and passing them to the algorithm that has asked for it.

Data binding to the application

- Data Binding component will be mainly responsible to receive data generated by the various sensors in the sensor registry of the platform
- It will get the data from the sensors mainly by connecting to the sensors instances via network.
- The data thus received will be published on the unique kafka topic provided by the sensor manager for the corresponding sensor instance.

Interaction with other module

- On receiving sensor data requests from running algorithms , the sensor manager will be checking the existence of the sensor from the platform repository to validate the request.
- Deployer communicates with the sensor manager using Kafka for assigning appropriate sensor nodes for algorithm and sensor communication.
- Sensor manager will get requests for sensor topics from init.py script running at some node. Sensor manager will start a thread to serve the get request of the sensor topic, this thread will be getting the sensor data from the sensor topic.

Actors

- **Platform Developer** - Will develop and maintain services provided by sensor manager
- **Admin** - Admin will be responsible to request the sensors required by the applications to run. Sensor manager will respond with the sensors available in the registry depending upon the location/placeholder id provided by the admin
- **App Deployer** - App Developer can use the Sensor Manager services to register new types of sensors and install valid sensor instances on the platform

Block Diagram

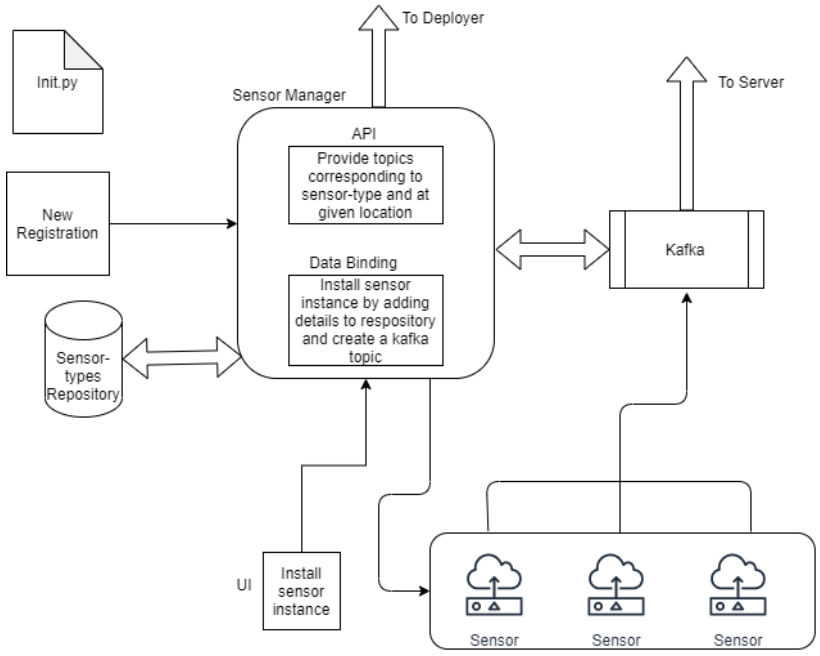

Fig.: Sensor Manager & Data Binding

Test Cases

- Sensor Installation: A new instance must not get installed if the type of that sensor is not registered on the module
- Every algorithm gets the data from the sensor that was asked only.
- The information model of the sensor type is being maintained.
- The sensor instances are getting filtered correct based on location or placeholder id
- The sensor data is provided only when required.

Functional overview

- Each sensor will have a gateway point which will be responsible for making the sensor data in and out.
- We assume the admin has collected the sensor instance information and types and it sends a json of the same to the sensor manager for the sensor registration.
- Sensor registration: registering the sensor with their location and sensor id. This module is responsible for the initial setup of the sensors and binds it to some gateway for the data.
- UI will be provided to the admin for installing sensors to the platform. Admin can register sensors by providing meta/config file consisting information about sensors like Sensor Type ,Geo Location , output format ,Sensor ID
- Sensor Manager from config file(send by deployer) will get request of sensor topic
- This config file specifies whether to get data from the sensor or control the sensor by setting some control attribute of the sensor instance.
- Each time for every request sensor manager will detach a thread for serving the request.
- This thread will be responsible for reading data from the sensor topic, writing the data to some other temp topic at some rate as provided by the sensor manager.
- Sensor Manager will listen to a common topic as per defined which is defined at the start time only and the system is aware of that topic.