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1. Personas and goals

FILIPPE ALVES DA ROCHA

Age: 51

Occupation: Aveiro' Secretary for Environment



Filipe is a respected mechanical engineer known for his work in making wind turbines more efficient. Also for this reason the mayor of Aveiro invited him to be his secretary for environment and he did not refuse. Living in a smart city as Aveiro he thought he would have an easier control over the city current ambiental status and traffic. To his disappointment he had a lot of data

coming from many sensors around the city, but he could only visualize it in a rudimentar and inefficient way. He could not visualize the environmental data with ease and the traffic data were only tables that offer little to no help. If he wanted to find irregularities he would have to search all sensors one by one and identify if there was an irregularity and in which sensor. Besides being tedious, all this task would be very much time consuming, time he needed for various other things. Because of this need of time he tried to find a system that could help him firstly visualize the data he got from the sensors and secondly to help him find irregularities within the city environment or traffic.

JOANA FREITAS

Age: 23

Occupation: Environmental Engineering Student

Joana is a 23 year old student of environmental engineering whose masters thesis is about the impact of green areas in the city environment and how it affects the well being of the citizens. She always liked city green areas since her childhood because these were the places where she saw a little bit of nature in her city. This was the reason why she chose this theme for her masters thesis. She finds it extremely difficult to collect, modulate and analyze all environmental data about the city while also collecting data from the city inhabitants. This difficulty arises mainly because when she wants to analyze the



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behaviour of the citizens she needs someone to collect the environmental data in parallel and needs also to modulate all of it while still needing to analyze it so the tests made can be more accurate. To simplify this task she would need a system that could give the environmental data about the city in a fast and accurate way and compare the results of any given moment with another in a visible and meaningful way other than just plain tables with data. For her, this system would give her access to the data that she preciously needs without effort and would allow her to gather the citizens data in a more efficient way and speed up the analyzing process.

RICARDO FARIA

Age: 21

Occupation: Computer Science Student



Ricardo is a 21 year old computer science student and is currently working with IoT systems. He's not one of the best of his class because he's what we can call a 'slacker', he likes to enjoy life besides just studying. He's also not the worst because he enjoys practicing his skill with projects outside his course. Besides all of this he's also a fan of the environment and thinks that we should all contribute for a sustainable future in order to enjoy life

more. In one of his ideas for projects he thought that he could do something to help in the environmental aspect of his city. He thought of a system that could display all the environmental data and that he or any other person could provide such data in a simple and mannered way. In order to do this the only thing he knows from classes are hard to learn and not scalable technologies, so he goes on looking for a system that is both simple and in which he can provide his own data.

Scenarios

Scenario #1: Dashboard

Every day Filipe gets to the office in the morning, turns his computer on and opens up CityZoom dashboard and his emails. Since there are no warnings in the app he assumes that everything is ok. But just to make sure, he checks up the overall values in the overall view of the city and confirms that there is no problem.

Scenario #2: Alarms

To test if all factories in Aveiro comply to EU regulations on environment. In order to complete this task with ease he sets alarms for all sensors that are near factories. To his displeasure some alarms immediately trigger filling his notifications area. Fortunately these alarms were all in the same area and around only one company so he knows there can be only one factory to blame.

Scenario #3: Data gathering

After a few weeks of conversations Joana finally was given permission to have full access to Aveiro's sensors. Now after the end of a day of citizen data gathering she just goes home and opens up CityZoom dashboard to view how the state of the city throughout the day and saves the data. She's happy because besides raw data gathering, CityZoom also displays how accurate the data is in the sensors and a basic modulation of the data.

Scenario #4: Data comparison and persistence

Joana had a rough week and with all her tiredness she forgot to download the data from the previous days. To her content CityZoom stores the previous days worth of data and can easily compare snapshots of some days. With this she just compared the behaviour of some citizens and then just opened the comparative view of moments in the CityZoom app and chose a few moments of those days.

Scenario #5: Checking the city status in the Citizen App

At Sunday mornings, Ricardo likes to take his dog to the park. There he likes to jog a bit and then come home to take a nice warm bath. When he woke up and opened up his window he felt an enormous heat wave coming inside his bedroom and thought that today might be too hot in the park for him to run or for his dog to accompany him. In order to avoid having to drive nearly 20 minutes from the suburbs to the park he goes to his phone and checks the city park status in the CityZoom App. After finding that the park where he usually goes he checks the temperature in the temperature heatmap and finds out that it is actually much warmer than his own suburb and decides he'll be spending the day there taking some sun baths.

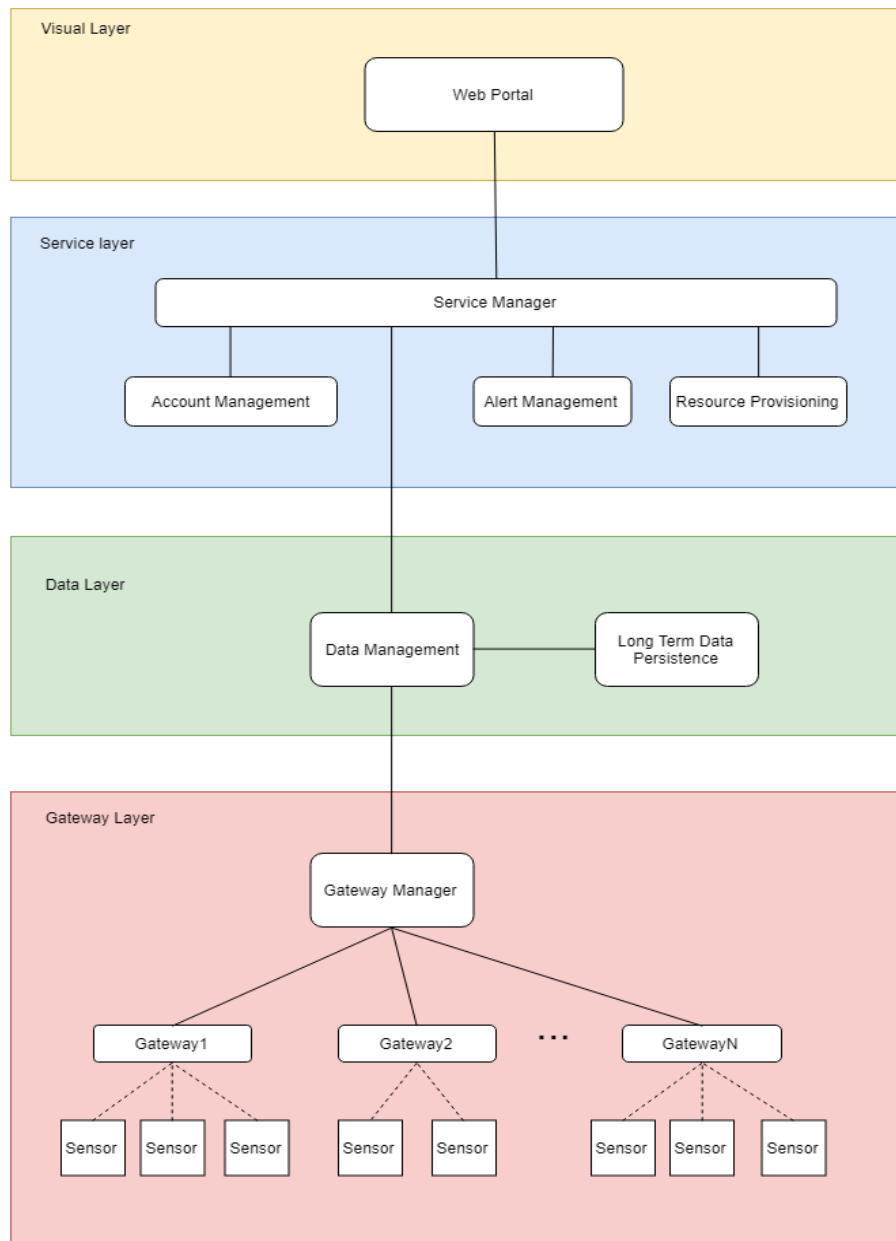
Scenario #6: Inserting data with the Citizen App

Ricardo finally found out about the CityZoom system and immediately downloaded the CityZoom App. When he found out that with CityZoom App he could get credentials to publish the data coming from his sensors at home directly into the CityZoom service he was amazed. Now he just has to find which type of sensor he can put (temperature, IR radiation, UV radiation, visible radiation, etc) on the system and send a request to the CityZoom main server, has exemplified in the app. With this app he finally grasped a little bit of how the environment was evolving at his home even when he was far away.

Scenario #7: Mobile sensors

Filipe has reached a conclusion: all the data coming from the sensors is great and helps a lot, but some areas usually have their sensors broken. In order to do this he asks to install mobile sensors in the trash cars and taxis of the city. With this he'll get data from every place that the vehicles pass. With the application being run on generic requests and not specific interfaces for just a few sensors, Filipe can buy many sensors at a small price and the installation costs will also be low. With this, Filipe will get an even smarter city at a smaller cost, making his image as Aveiro's Secretary for the Environment become even greater.

2. Architecture



The architecture will be composed by four layers:

- Visual Layer, the web interface that will present the functionalities to the user.
- Service Layer, the layer where permission and account handling occurs. This layer will store all existing user accounts, all the resources allocated in the broker and all the alerts configured in the CityZoom platform.
- Data Layer, composed by the broker, data handling logic and data persistence. Since data is required to be stored for long periods of time, the data will be stored in the Long

Term Data Persistence. The Data Management will be responsible for fetching data from the broker and storing it in the data persistence, as well as transporting information from the service layer to the Gateway Manager.

- Gateway Layer, responsible for managing the data flow between the sensors and the broker.

3. Teste e Validação

The following points are the functionalities the system should provide:

1. Allow the user to check both past and real time information on different environmental aspects (EA), like temperature, concentration levels of O₃(Ozone) and CO₂(Carbon Dioxide), general air quality evaluation;
2. Present the user with notions of progression or regression regarding the information of the several EA;
3. Give the possibility to make comparisons of the EA's on different regions;
4. Heatmaps regarding the different EA;
5. Flexibility, i.e. the system can deal with the addition of new sources of data collection (sensors);
6. The system should also be able to handle the addition of new areas (cities);

To test how people may evaluate the system's objectives and purposes one of the group members (José Paiva) made an initial and brief meeting with one of our personas. In doing so, we meant to check how our future users see the system and what they feel like is missing, so that we can guide ourselves in the right direction as soon as possible and correct possible early mistakes and misconceptions.

The subject we gathered with (Vera Rodrigues) is an environmental engineering student and investigator of the same scientific area. She seemed very excited about the project for the following reasons :

- Collecting data is a very hard task. Without an informatic system the task becomes way too hard, especially to gather information from different areas, and for people not connected to the development of informatic systems the solution is either hiring someone to do it, or using something that already exists;

- In the event that no system like ours is used, the data collected may have little precision and rigor;
- The ability to access data from different areas serves not only comparison purposes, but it also removes the need to make unprecise extrapolations;

The group is planning on having a policy that values proximity to the users and, having that in mind, new meetings will surely happen to make sure the team is moving in the direction the users want to see the project go.

4. WebGrafia

Imagem 2:

<https://why.org/wp-content/uploads/2019/01/2018-03-01-e-lee-bobby-henon-philadelphia-city-hall-city-council-768x432.jpg>

Imagem 3: <https://m.media-amazon.com/images/S/aplus-media/mg/27639e65-c010-46d2-9cc5-315e99e31daf.jpg>

Imagem 4: http://www.edudemic.com/wp-content/uploads/2017/05/notes_on_Computer1.jpg