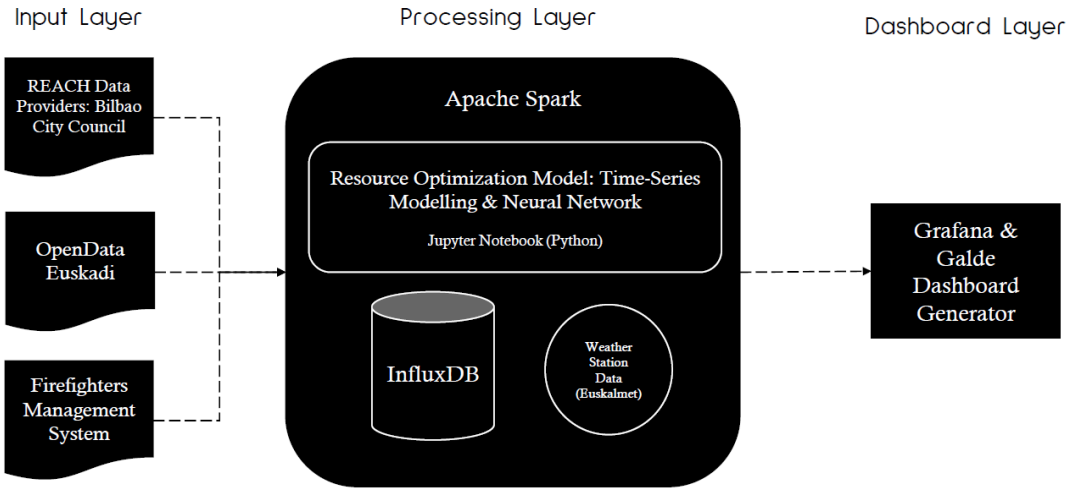
1. Technical Specification Double-side Page

2. **TECHNICAL SCOPE:** Summarize the mock-up devised during the EXPLORE phase: how have you addressed the challenge/Theme Challenges and tackled with its requirements and data. Include a diagram.

To tackle this Challenge, we have taken the dataset extracts provided in the Challenge description (https://www.reach-incubator.eu/project/optimization-of-bilbao-firefighters-interventions/). To frame the solution (FireDash, by Galde) to build a model that could optimize firefighters' resources, we built a mockup with 3 layers:

1. **Input Layer:** It consists of the data inputs given by the Data Provider (CONNECT5 and Bilbao City Council), as well as OpenData Euskadi and the current Firefighters' Management System. To better understand the kind of equipment and infrastructure the Bilbao City Council might have, the Council itself gave us relevant information about equipment and team composition.
2. **Processing Layer:** Consisting of the required processing, we did a small fine-tuning of a neural network, as well as testing whether the time-series model could work to propose a decent resource allocation.
3. **Dashboard Layer:** We started to use Galde's Dashboard Generator to check the latency of results and check if we could give real-time responses graphically.

GALDE Fire Dash REACH



3. **ALGORITHMS, TOOLS AND CONCLUSIONS:** Detail the algorithms and tools identified to accomplish the challenge/Theme Challenges. Show clear understanding of the used REACH dataset/s and addressed challenge/Theme Challenges.

The employed tools are described by later below:

1. Input Layer

We had to convert and model the data as described in the Smart Data Models standard, referred to PointOfInterest, Risk, Hazard and Asset. The data was provided as CSV files, so we could work with that data directly after applying those transformations.

2. Processing Layer

Since we are facing a Big Data problem, we first thought about using neural networks (NN) to model the resource optimization algorithm, and we had several doubts having considered genetic algorithms as an alternative. However, after speaking to the Data Providers we noticed that we would have a big amount of continuous / time data to analyse, hence discarding genetic algorithms and returning back to NN to represent this model.

Additionally, the time-series component is essential, since FireDash's main triggers will be weather events and/or emergency notifications. Hence, we decided to use InfluxDB to handle all the time-series data.

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3. Dashboard Layer

Finally, we used Galde's Dashboard Generator and its Apache Spark connector to create a simple dashboard. We still do not have the specific requirements the Bilbao City Council has, so the KPIs will need to be refined with the relevant stakeholders during the following Phases of the REACH Incubator.

4. **SCALABILITY AND FLEXIBILITY OF THE SOLUTION:** Discuss whether the solution can truly cope with humongous and increasing datasets and how flexible it is to adapt to other related domains and integrate into Data Value Chains (DVC).

We decided to handle our data storage with InfluxDB, as it is prepared for this kind of challenge based on time-series. Additionally, we configured Apache Spark to tackle the data processing, which as a distributed processing engine can handle a lot of data processing.

Since our solution models the incoming data to the Smart Data Models standard, it can be easily integrated into Data Value Chains. Additionally, we are testing the usage of IDS Connectors from the International Data Spaces Association so that data could be transferred to different domains and develop new data products as a result.

5. **DATA GOVERNANCE AND LEGAL COMPLIANCE:** Describe the security level of the proposed solution, i.e. how authentication, authorization policies, encryption or other approaches are used to keep data secure. Explain how will be compliant with the current data legislations concerning security and privacy (e.g. GDPR).

To access the dashboard, a Role-Based Control Access (RBAC) is applied so that only managers of the firefighter teams' resources will be granted such access. In terms of encryption, all the personal data will be anonymized, as it is not essential to make the system work. To do that, we will test the usage of FedEHR Anonymizer (https://docs.reach-incubator.eu/reach-toolbox/fedehr-anonymizer/index.html#fedehr-anonymizer), a tool offered by the REACH Incubator. By applying this measure, Galde would be complying with the GDPR standards for this sector.

6. **QUALITY ASSURANCE AND RISK MANAGEMENT:** Describe the quality process planned for the final product. Technologically, which are the potential risks in all the phases of the project (design of the solution, development, testing, deployment...) and indicate mitigation plans to still fulfil the challenge/Theme Challenges and data provider requirements.

To deploy FireDash as the final product, we foresee that we will need to handle these risks in the following stages:

Design of the Solution:

- Lack of clarity on the relevant indicators to be optimized. It is something that might happen, but Galde hopes to solve it quickly as there are Emergency Plans already defined by the local government.

- Lack of coordination. Public institutions have their own interaction and work times, so both parties will need to establish a committee with the relevant stakeholders to comply with the deliverable times of the REACH Incubator.

Development & Model Training:

- Missing internal data: We might have the issue that Galde does not receive enough data about tactics and interventions, nor teams' infrastructure data to fine-tune the resource optimization model.

- Integration with previous systems. Current data systems installed by the stakeholders might not have APIs nor feasible ways to integrate, which might probably lead to delays on the implementation. Our system is ready to integrate multiple data sources, but those systems will need to be analysed as soon as possible.

Testing:

- Difficulty of generating testing scenarios. Since FireDash wants to help in the mitigation of emergencies, these being one-off events, we will need to coordinate with the relevant public institutions to simulate a few emergency scenarios.

Deployment:

- Missing continuous data: IoT devices quality and information input delay. Something we foresee is that the deployed IoT components (if any) and weather stations might not give real-time data, which could lead to an inevitable delay on the whole solution, where we cannot do much to solve it. We can make use of time-series models to predict what might be happening next and try to give an estimate, but the missing data spans should not be too long.

- Quick, unexpected weather changes / natural disasters. Nonetheless, Euskalmet serves this data fast enough.

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