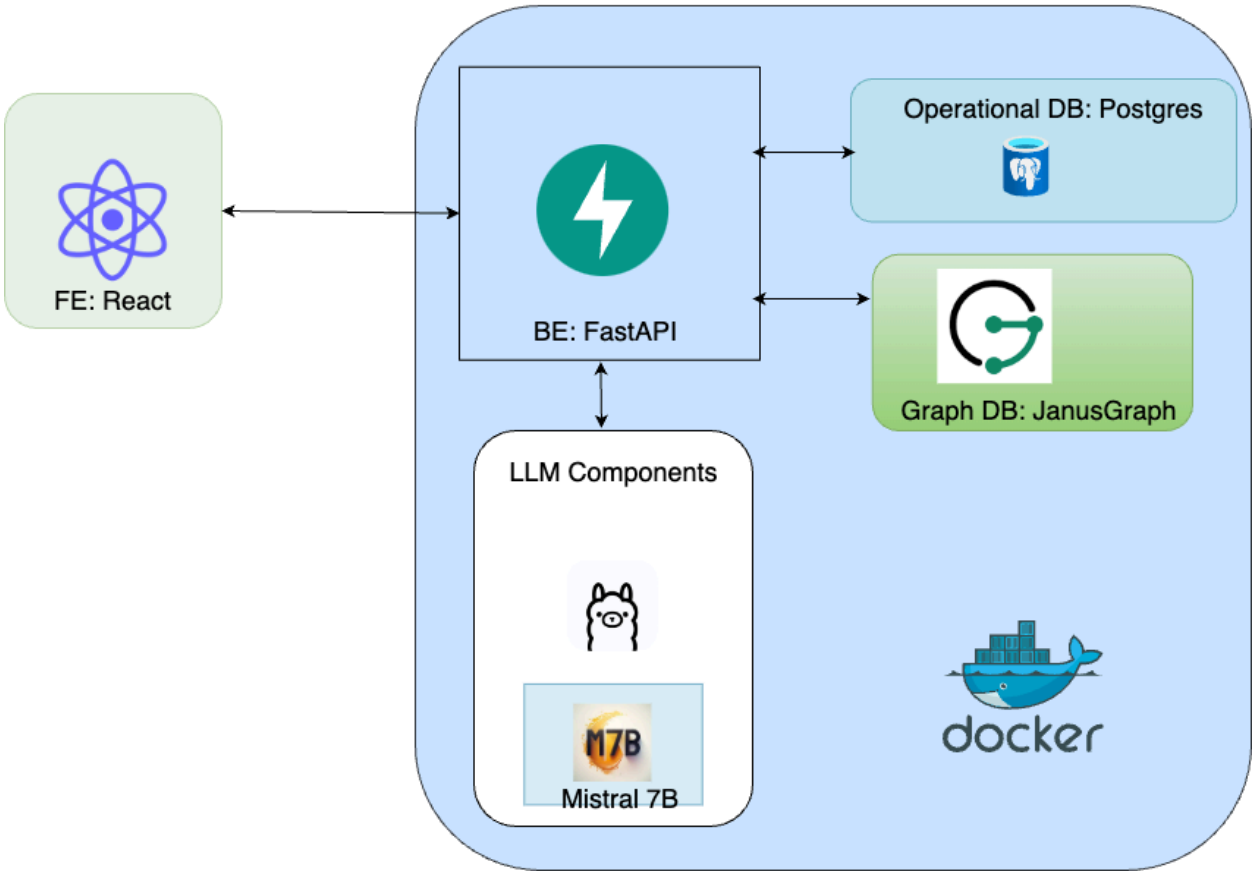
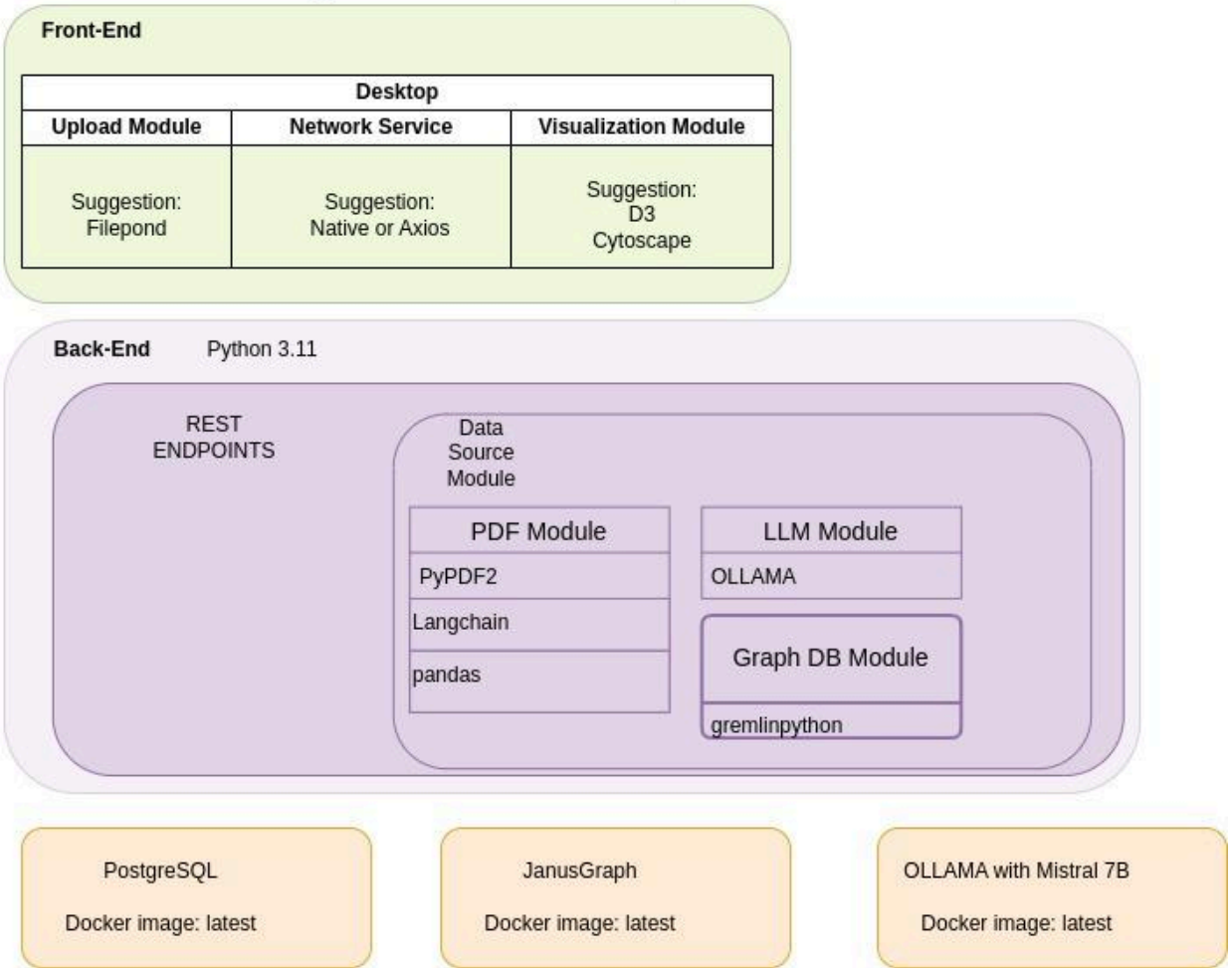
An overview diagram of runtime components



An overview diagram of code components



A summary of the underlying technology stack

The whole application is thought of as a web app. It will have its **FE** (UI) and a **monolithic BE** with all its services containerized with **Docker.**

Front-end:
We are going to use **React** with its libraries

- Upload module: We are using **Filepond**
- Networking/Communication: **Native** or **Axios** for sending **HTTP** requests
- Visualization module: We are going to use **D3** to show the user the knowledge graph

Back-end:
The backend part will be built around the **Python** ecosystem. The main app will use **FastAPI** as a web framework**.**
The supporting services will be the following:

Operational DB → **PostgreSQL**: Fast, reliable, scalable database.

GraphDB → **JansuGraph**: One of the most popular open source graph db which will help in saving the knowledge graph.

LLM → **OLLAMA**: A tool that helps us run large language models on our local machine and makes experimentation more accessible. Among many features, it exposes an endpoint that we can use to interact with a model.

We will use a pre-train LLM model, **Mistral 7B,** to get a meaningful relation between the data. Using different prompts select values for nodes and edges for meaningful graph

Packages which will help in working with PDFs are going to be:
PyPDF2: Read pdf byte data and transform it into a string.
LangChain: Is a framework designed to simplify the creation of applications using large language models. It also has other helper functionalities. Our use case is for text chunk creation to be fed to the LLM and in the future to make calls and build a Chatbot.

Pandas: Is a Python package for pre-processing and manipulating datasets.

Development and Deployment:
Docker: For consistent development environment and isolation
Git: Used for version control and efficient collaboration.

A textual explanation of the diagrams and choices

Based on the team's experience and initial requirements for the project, we decided on the below architectural & tech stack decisions to deliver within the deadline a final product.

Architectural Decisions:
Front-end: This layer handles the user interactions with the application. It makes it easy for the user to upload documents and interact with the graph.

Back-end: This is the logic layer, handling the data processing, for each document and creating the Graph. We agreed on a monolithic approach with supporting services since it is the fastest and easiest implementation to deliver an MVP.
Technology Choices:
The main technology used is reliable, open source, and offers great scalability.

React: Chosen for robust ecosystem, it is a component-based architecture. Effective UI and better user interaction.
D3: offers low-level control over every aspect of data visualization. can be integrated seamlessly with other JS libraries.
Python: The main language is Python since it was per the client's request. This led to the tech stack described above. It is easy to use and has extensive libraries, is well-suitable to develop backend logic, and works with the LLM model.
FastAPI: Essential for handling requests and interacting with the database has asynchronous support and is easy to learn.
OLLAMA & Mistral AI: Mistral 7B is better at understanding text documents than statistics(Lamma3).

Interaction Between Components:
The front-end communicates with the back-end through RESTful APIs. The back-end utilizes the LLM for processing the text chunks to create entities (nodes) & relations (edges) for the graph.
2 Databases, an operational one to save info. about the uploaded PDFs and a graph db to save the generated knowledge graph.

Scalability and Maintenance:
With a monolithic approach, it's easy to maintain and work as a team with different experiences.

Also, the app is very easy to scale horizontally or vertically. The only problem is if one of the services/modules needs to be scaled the whole app needs to be scaled. In the future having module separations helps to later substitute them with their service for a microservices architecture.