RapidCare – Team# 25
- Smart EHR System

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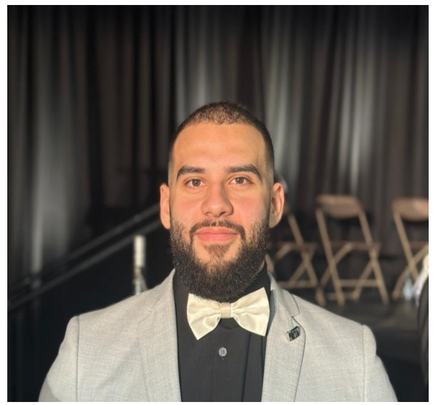

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Agenda

- Problem Overview
- What Could We Do?
- Solution Overview
- Demo
- Key Components
- Design and Architecture
- Impact Of The Solution
- What Next?
- Q/A

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Problem Overview

- **Extreme shortage** of family doctors in Ontario [1]
  - Number of patients without one will rise from **600,000 to 2.5 million** [2]

- **Massive wait times in ERs**
  - With average length of stay 22.7 hours [3]
  - Patients leaving without being seen

- Healthcare professionals have a **massive documentation overhead** in their day to day
  - Solutions exist, with **complex UI**
  - **Hard to traverse** through patient **data**

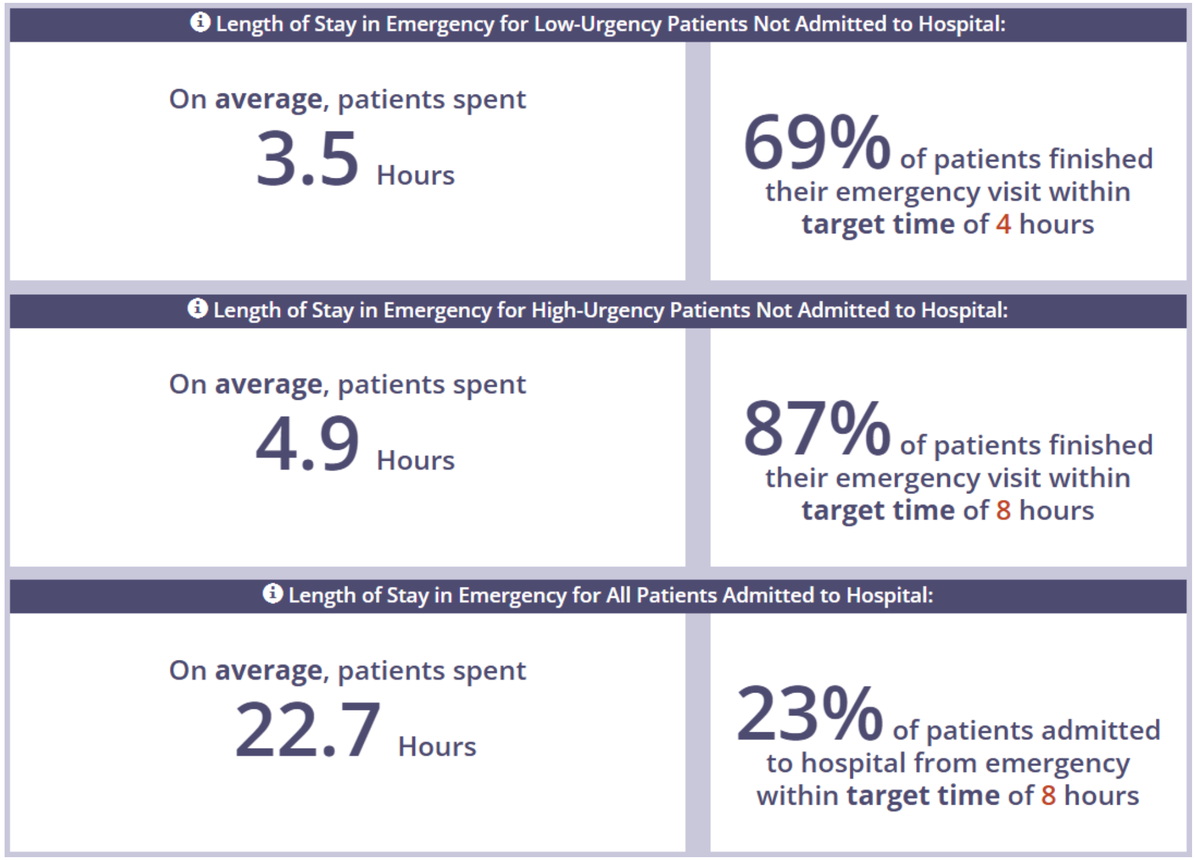

Figure 1: Stats for Wait times in ER [3]

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Solution Overview

- Effectively record and store patient data, clinical notes, treatment plans with **real-time data access**
- Record, transcribe, and classify patient-doctor interactions to **automatically fill patient records**
- Provide **comprehensive diagnosis predication**
- **Comprehensive action plan** to address diagnosis prediction
- **AI Assistant**, to **query** patient previous visits and **health conditions**
- **High discoverability** and **clear affordances** for admin and healthcare professionals

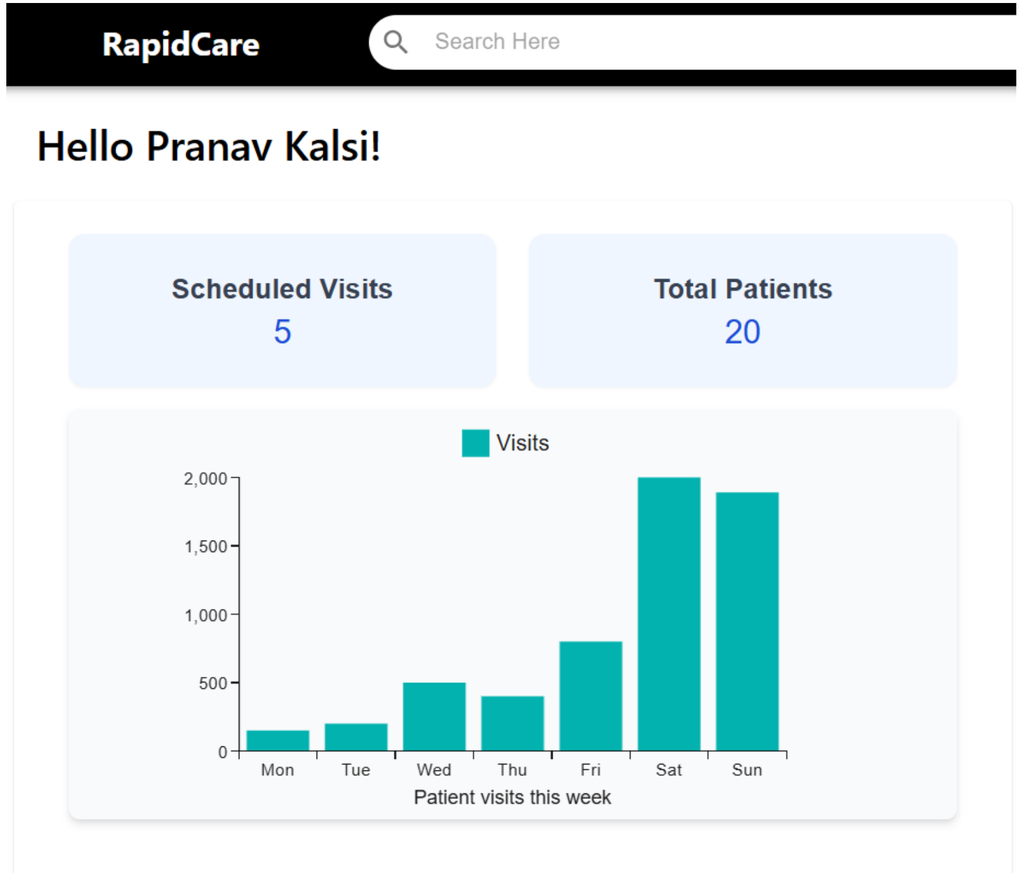

Figure 2: Snapshot of RapidCare dashboard

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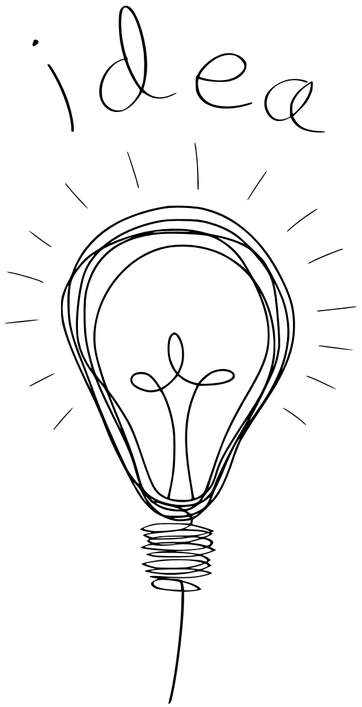
What Could We Do?

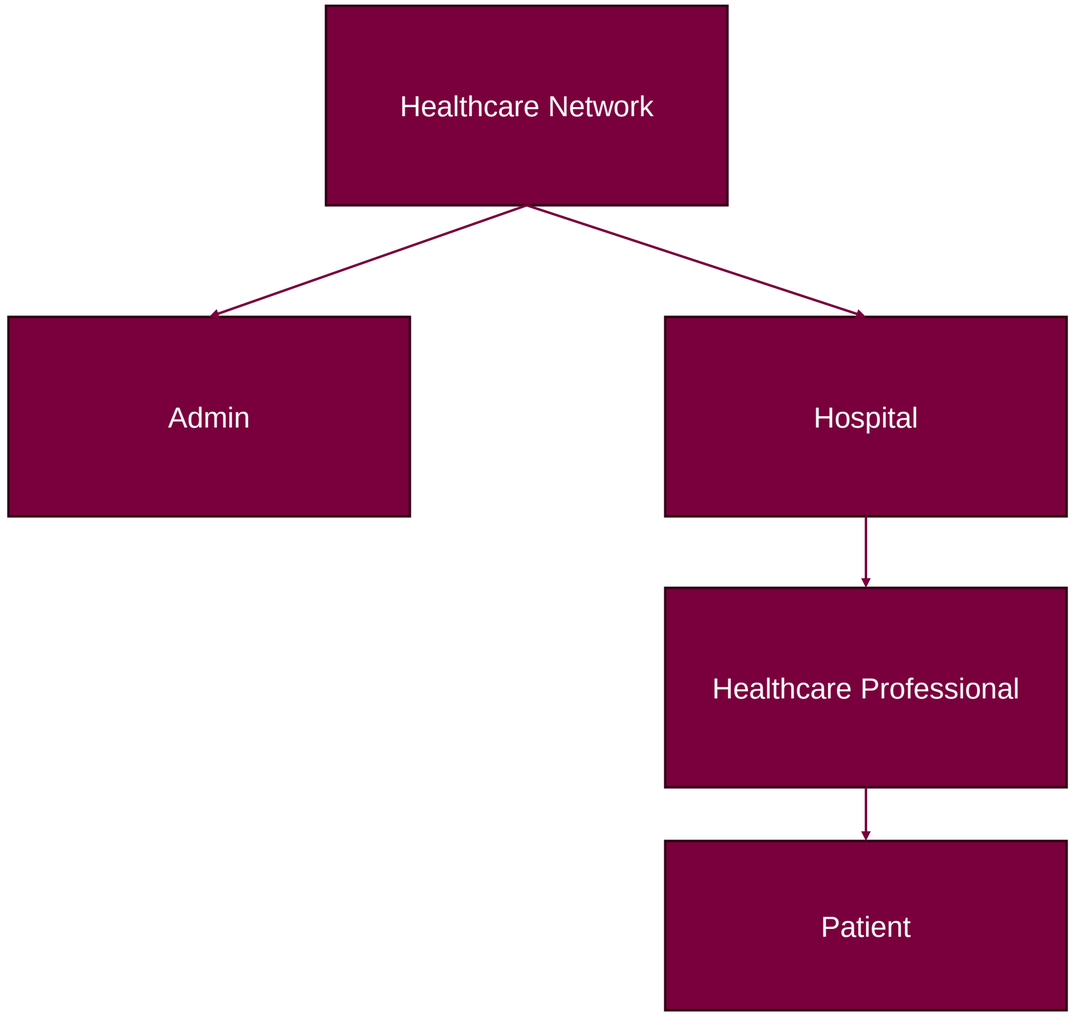
- The NLP techniques and speech recognition software have made significant advancements in recent years
- These technologies can be adapted to improve accuracy and efficiency of healthcare workflows
- Retrieval and Generation can be used to provide diagnostic and medication suggestions based on accepted documentation
- Improve User Interface to improve user experience



Background on Healthcare Networks

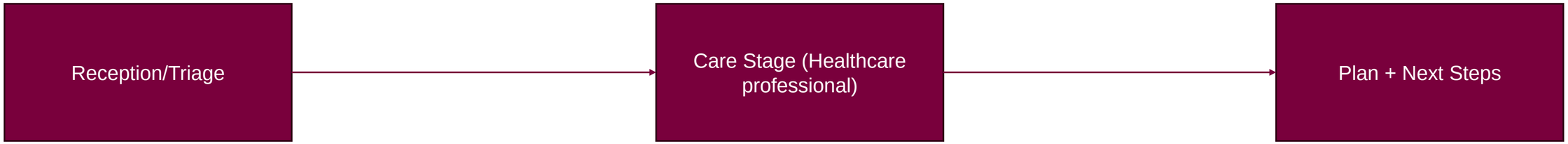
Health Care Network

Brief Overview



Health Care Network

Patient – Treatment Interaction



Application Demo

Let’s checkout the app!

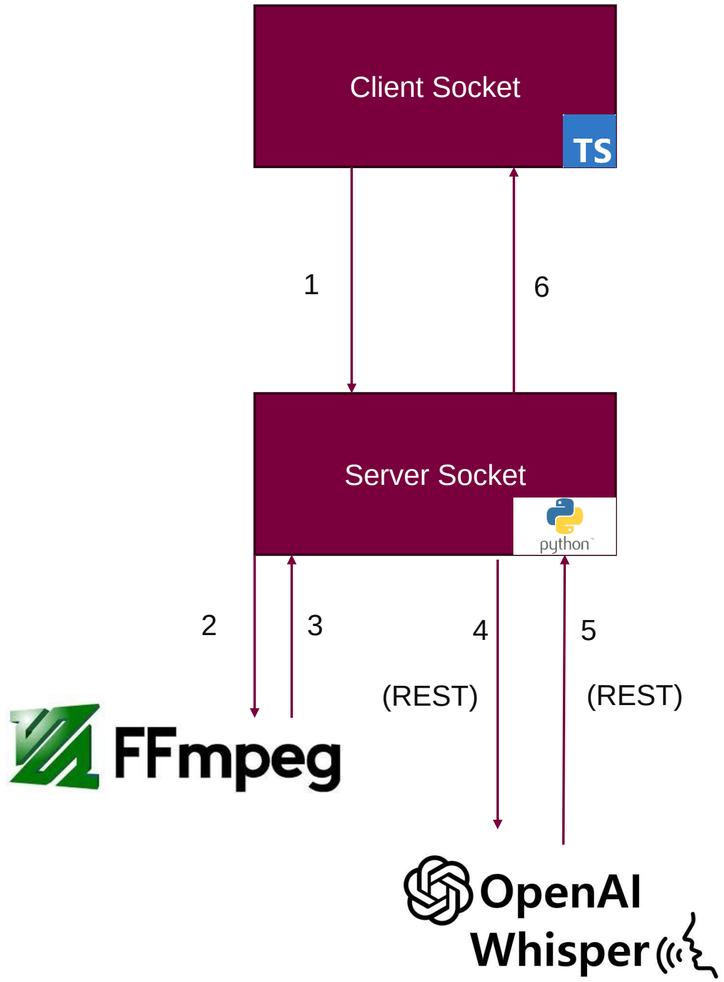
Interactions within the key components.

Inside operation.

Voice-to-Text Transcription

The Insides

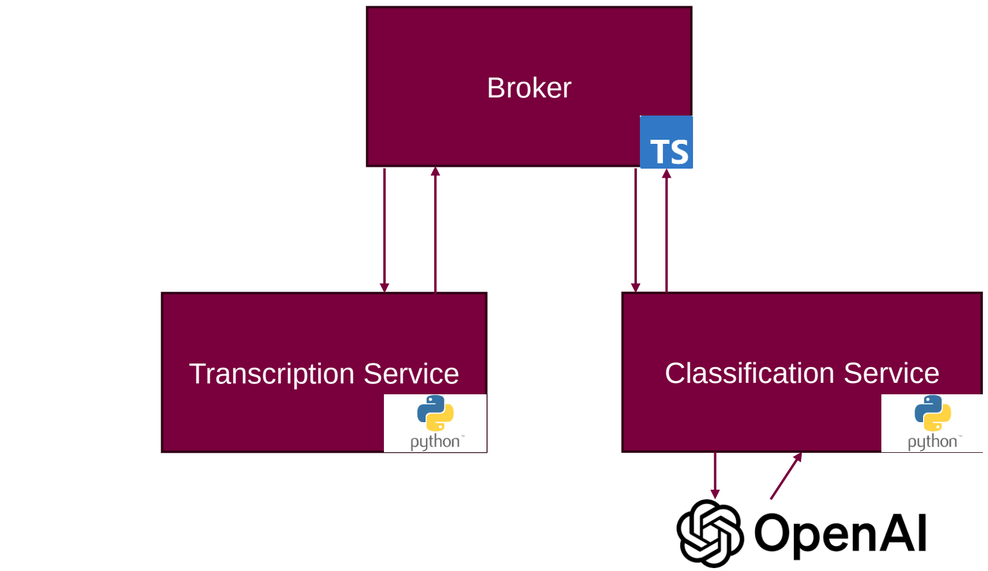
- Using **socket communication**, the frontend records and sends audio bytes to the backend.
- Backend service receive the bytes converts into an audio format (webm)
- Sends the webm over to **Whisper for Classification**

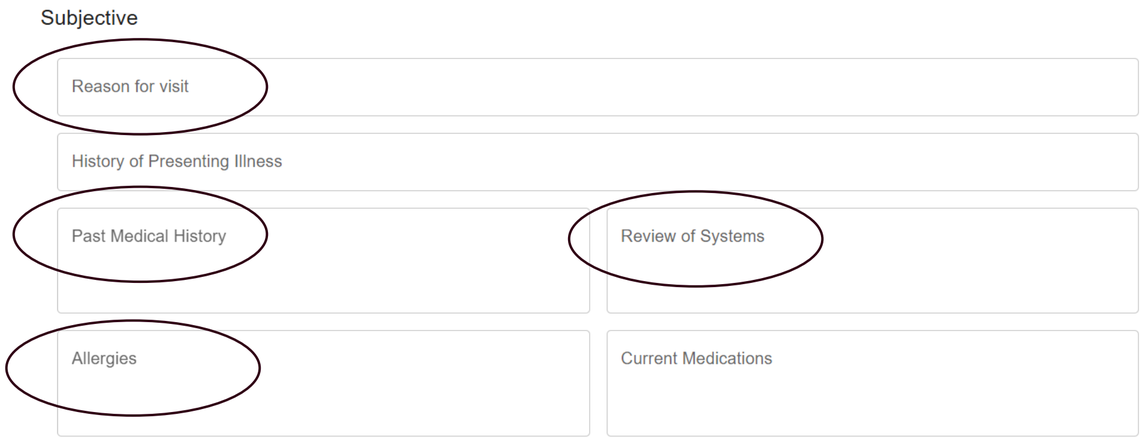


Classification Service

The Insides

- Using **socket communication**, the frontend records and sends audio bytes to the backend.
- Backend service receive the bytes and responds with **transcribed text**.
- Using **LangGraph** the transcription is classified.

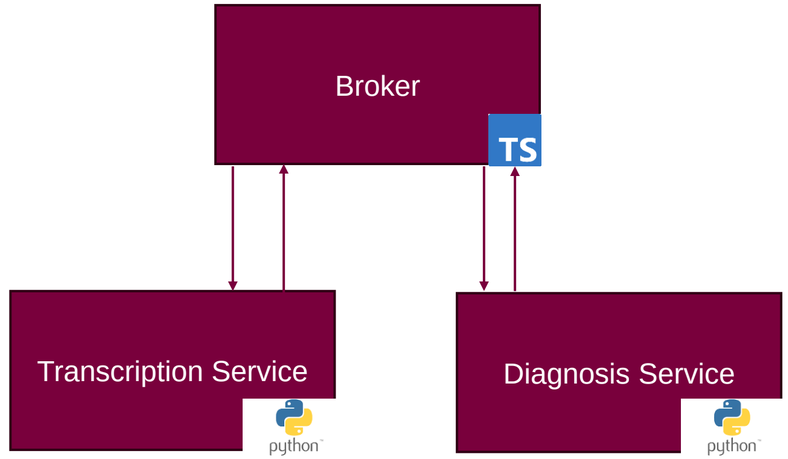




Diagnosis + Plan Prediction

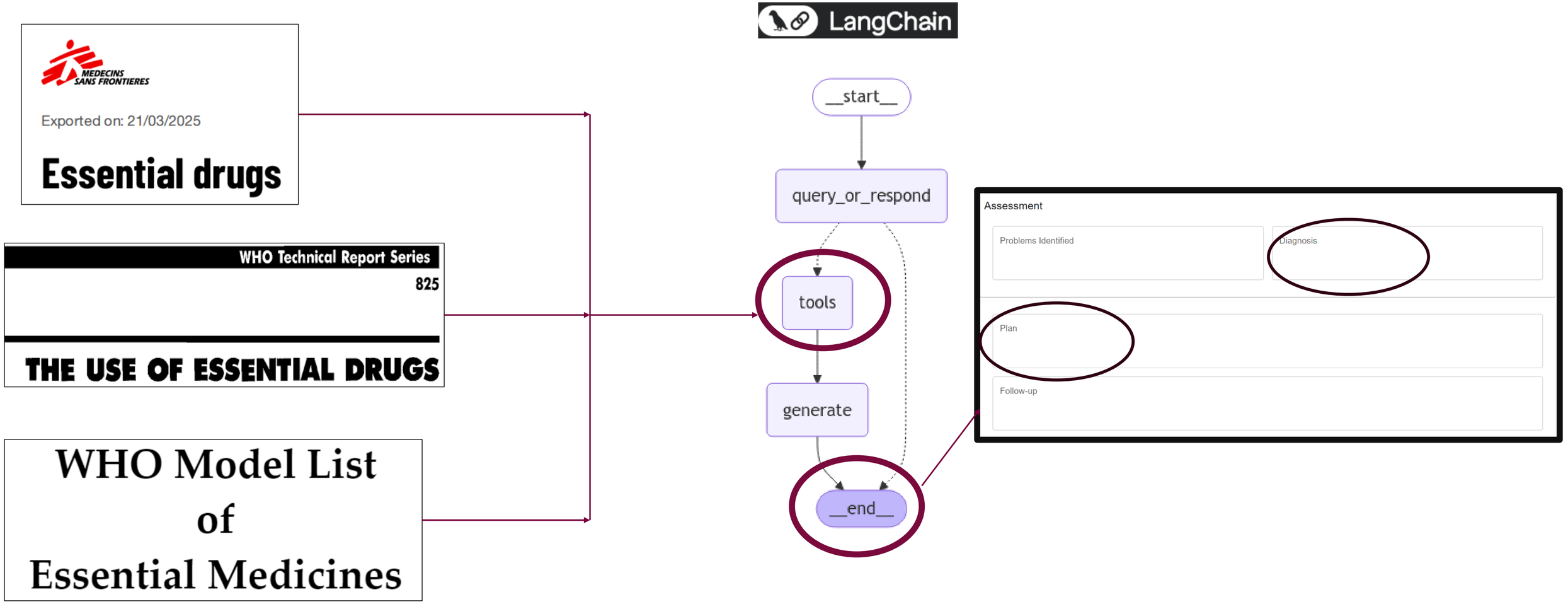
The Insides

- Based on patient doctor **conversation** provide an **analysis** of what possible **diagnosis** could **apply**.
- Based on the **analysis** provides a **plan** of actions and **medicines** based on **supported context**.
- The **context** for the **model** is **reputed** and **accepted standard protocols** such that the outputs are **focused to certain norms**.



Diagnosis + Plan Prediction- Context Based Reponses

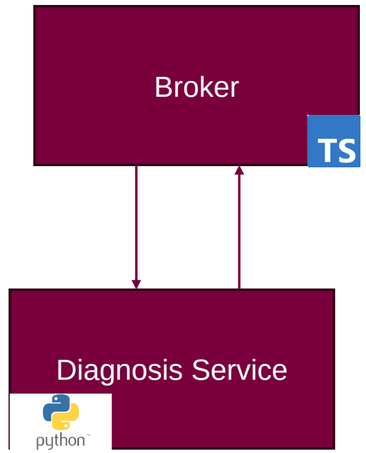
RAG Architecture



AI Assist

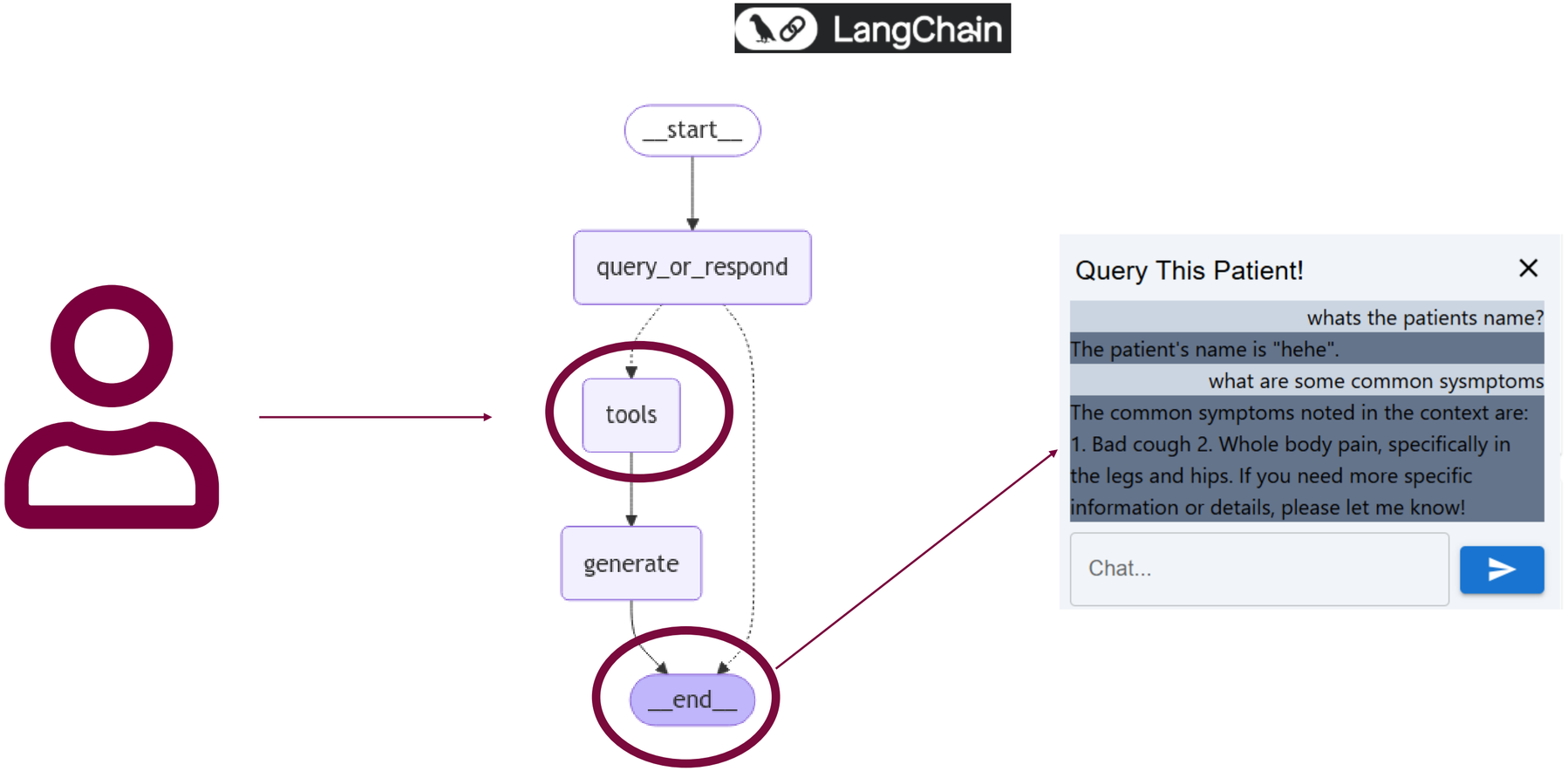
The Insides

- Based on the patient context, provides information on the patient.
- Can **improve data-lookup efficiency**, current solutions provide poor functionality.
- Functionality **can be extended** to adding more context for other conversation base interactions.



AI Assistant - Context Based Reponses

RAG Architecture



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Design and Architecture

- Adapted Model-View-Controller (MVC) architecture
  - Easily **extendable design** as new features and services are added

- Single responsibility principle
  - Each microservice (transcription, classification, AI assist etc.) has **single responsibility**
  - Ensures **cleaner, maintainable, and scalable code** while minimizing technical debt

- Human-Computer Interaction (HCI) Principles for UI
  - Key features and actions are **discoverable**, reducing cognitive load
  - Appropriate **feedback** such that users are never lost.

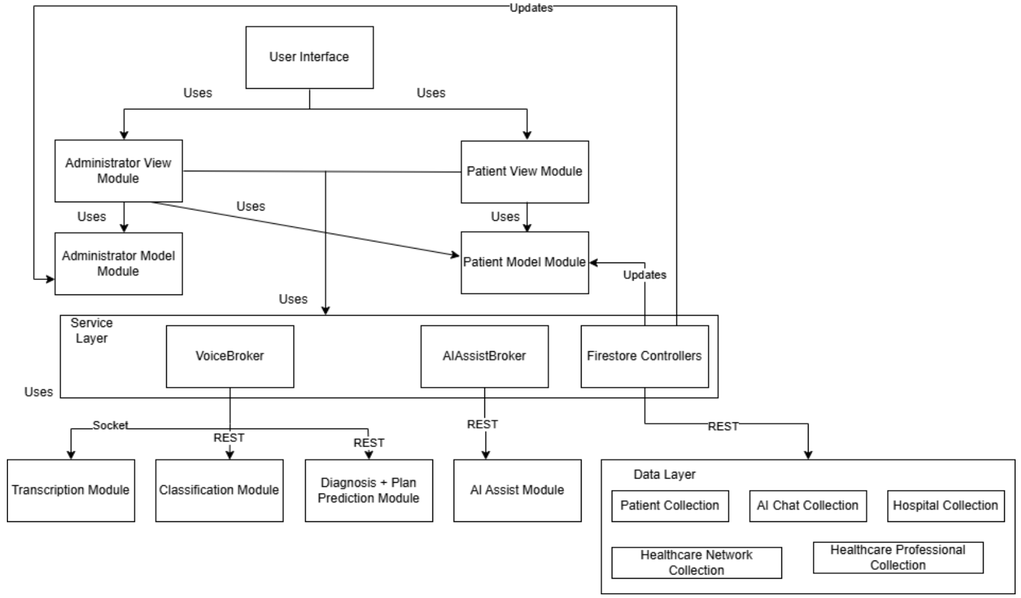

Figure 3: System design diagram

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Impacts of the Solution

✓ **Improved access to healthcare for patients**
- Reduction in documentation and administrative overhead
- Reduction in ER wait times and patient flow

✓ **Improved patient data management**
- Comprehensive data modelling ensuring accuracy and reliability
- Real-time data access facilitating quick decision making

✓ **Reduced burnouts for healthcare professionals**
- UI follows HCI principles ensuring ease of use and user-friendly interaction
- Intuitive and easy to navigate UI, minimizing learning curve

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What Next?

- **Expand functionality to auto-generate prescriptions, referrals**
  - Faster decision making and enhances efficiency
  - Reduce errors

- **Seamless integration with blood work labs and diagnostic centres**
  - Improved data exchange
  - Streamlined workflows

- **Advanced workflow analytics for hospitals and clinics**
  - Optimize operations
  - AI prompting the patient for more detail to further improve diagnosis suggestions
  - Help hospitals to better allocate resources

- **Multi-language support for healthcare professionals**
  - Improves accessibility for diverse populations

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Thank you!

Questions?

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