Your Health Is In Safe Hands (HISH)

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Motivation

Achieving accurate diagnosis is a crucial objective for any healthcare organization because it improves survival rates significantly and avoids cost incurred by erroneous diagnosis. However, providing a great diagnosis assisting tool comes with several challenges:

1. The lack of sufficient data to train a good diagnosis model
2. Data protection regulations and lack of incentive to collaborate results in healthcare groups working independently despite fighting for the same cause
3. Lack of existing infrastructures to facilitate data sharing in an isolated fashion

Objective

Aims to provide a cloud-based platform for medical professionals to collaborate and efficiently use models that assist in diagnosing patients, known as HISH. HISH provides a user interface for healthcare workers to input, store, contribute, track patients records and provide specific diagnosis using a pre-trained model.

Approach

The architecture of HISH can be divided into 4 broad sections to facilitate a multi-tenanted service: web application, database, backend operations and machine learning. HISH was developed within a Virtual Private Cloud (VPC)

1. Web Application: ReactJS to develop the frontend webpage, AWS Cognito for user authentication, EC2 to host servers (ie. Elastic Load Balancer and Auto Scaling handled by AWS Elastic Beanstalk)
2. Database: PostgreSQL RDS with a multi-tenancy design that shares a database instance but uses tables to isolate tenants to their own respective data
3. Model Training: A machine learning training pipeline was implemented to occur periodically using EventBridge, Lambda and EC2
4. Backend: Autoscaled and Load balanced EC2 instances to handle updates, query and interaction with the frontend using Python Flask. Dockerized Backend image stored in AWS Elastic Container Registry.

Implementation

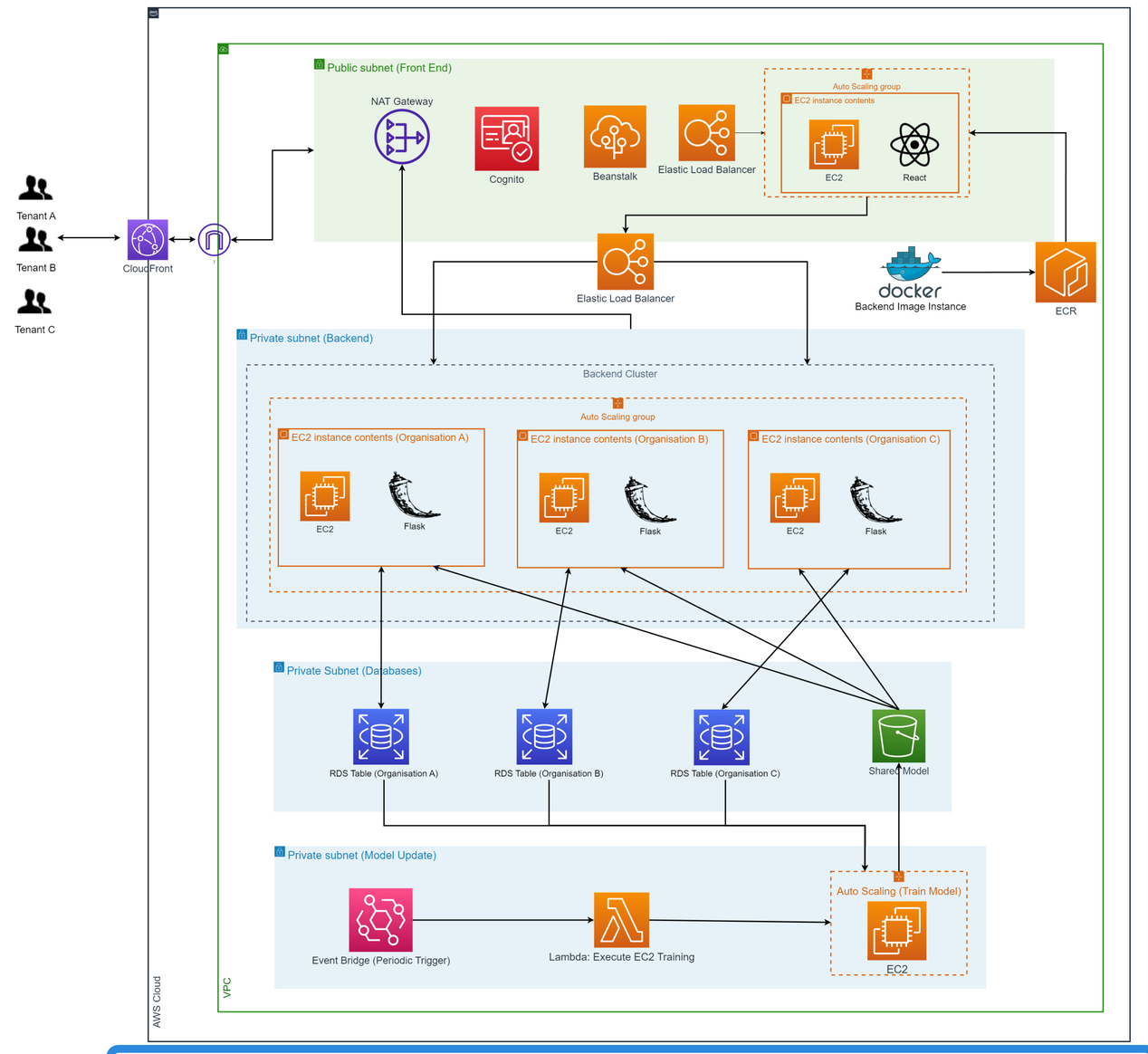
Key Functionalities

- User Interface to Facilitate Machine Aided Diagnosis
- Secure Data Sharing
- Automatic Model Training

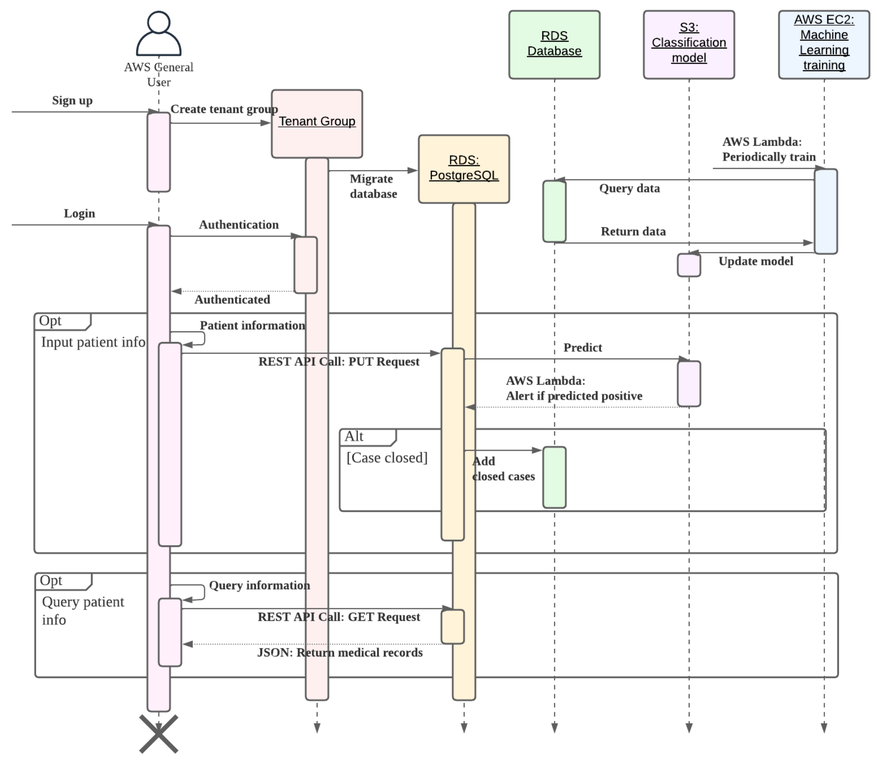
Cloud Services & Frameworks

- Cognito: Authentication
- RDS: PostgreSQL
- S3: Object Storage
- Event Bridge: Periodic Trigger
- ReactJS: Frontend Framework
- EC2: Computation
- Lambda: Trigger Events
- Elastic Beanstalk: Orchestration for deployment
- ECR: Docker Images
- Flask: Backend Framework

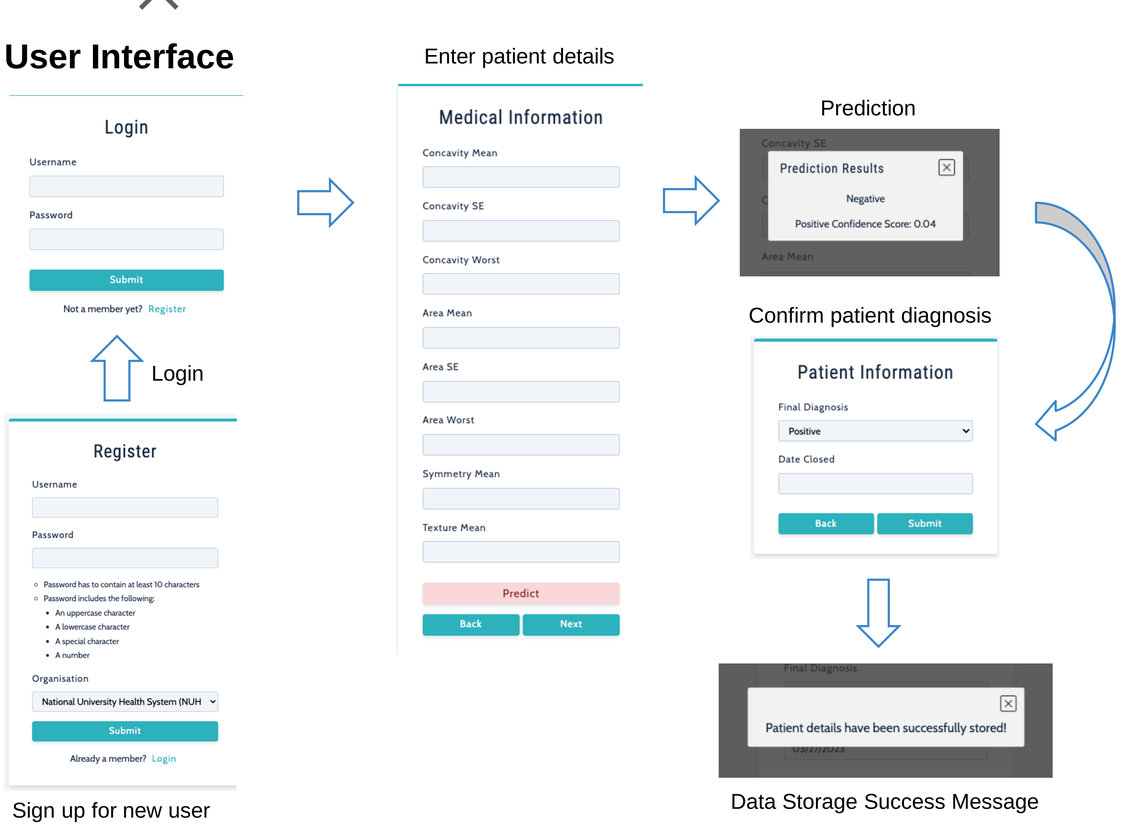
AWS Architecture



User Interaction

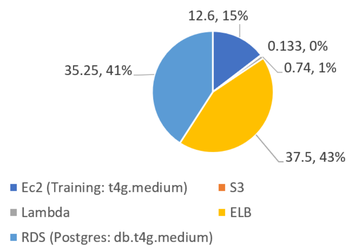


User Interface



Cost Analysis

Monthly Total Cost = USD 86.23
Free Tier Components: Cognito, Frontend:Ec2 t2.micro



Revenue Model

The pricing model of the service will be based on subscription plans to cater to different consumer needs.

- Price = AWS Monthly Cost of USD86.23 + Development Monthly Cost of USD500 + 20% profit margin

Package	Duration	Cost
Standard	1 year	$8490/yearly
Try it Out	1 month	$750/month