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Cloud-based Blood Bank Management System with Dynamic Data Updation

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***Abstract*— The dynamic blood bank management system using cloud is a cutting-edge solution designed to revolutionize blood bank operations. hosted on a secure and scalable cloud platform, this system provides an user-friendly interface and provides availability around the clock. The proposed solution aims to address the challenges of accessibility and quality in India's Healthcare system by leveraging the technology, improving infrastructure and fostering collaboration between cloud technology and the medical sector. The system is used to provide real time monitoring for blood inventories, cloud's security feature provides security against the patient's and donor's personal medical data complying with HIPAA policy. The methodologies used to build this system are project planning, AWS account setup, database design, database creation, database migration, API development, user interface development, data security and access control, testing and validation and monitoring and maintenance.**

***Index Term*— Cloud, AWS, Blood Bank System.**

I. INTRODUCTION

Healthcare is a broad and complex field encompassing the prevention, diagnosis, treatment and management of illness, injuries and overall well-being. It is a critical component of society, aimed at promoting and maintaining the health of individuals and populations [1]. Public Health focuses on the well-being of the entire population and uses strategies like disease surveillance, health education and promotes healthy behaviors. The government plays an important role in public health care through public hospitals and primary healthcare centers. The government's flagship program, 'National Health Mission' (NHM) focuses on improving child health, paternal health, and sanitation and disease control. [2]

One of the significant hospital departments is the pathology department. It prepares blood in accordance with the blood types of the patients who will receive it. A small number of units, including the blood distribution, transfusion, and house units are in operation. India's healthcare system is marked by its complexity, diversity and the challenges it faces in providing accessible and affordable healthcare to its vast population. Blood banks are vital components of healthcare systems worldwide [3]. These specialized facilities are responsible for the collection, testing, storage and distribution of blood and blood products. The blood bank will go through a number of tests to make sure the recipient is free of a major illness before it is given to the patient.

The goal is to maintain an adequate and safe blood supply, and blood banks work consistently to fulfill these goals. Blood donations from voluntary donor and the lifeblood of these banks, serving as a critical [4]
resource for medical treatments, surgeries, trauma care and emergencies. Blood Banks have increasingly adopted cloud technology to enhance their operations and to improve overall efficiency.

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A web baked tool called blood bank management system can help with a blood bank's handling of bag information. This system allows the user to enter the results of each blood test that has been performed into each bag of blood that the blood bank has received. Through this system hospitals and clinics can request blood units swiftly with recipients receiving immediate operations, aiding resource allocation.[5] The goal of this project is to create, develop and deploy an Amazon Web Services (AWS) powered cloud-enabled blood bank management system to enhance efficiency, accessibility and responsiveness of blood donation and distribution processes in India. [6]

II. Literature Survey

- Implementation of Blood bank system based on dynamic location updation was published in 2021, the techniques used were PHP, some of the advantages are it reduces the time and effort for the acceptor of the donor to maintain the health record of the patient. The limitations were internet connectivity and was unable to find the location of the receiver. [7]
- Implementation of Online blood bank management system was published in the year 2021, the techniques used are HTML, CSS, PHP, Javascript and SQL for databases. Some of the advantages were it has an easy user interface and lets the admin have access to the dashboard where they can oversee blood issues and requests. The limitations are it may cause errors while functioning. [8]
- Cloud based online blood bank management system was published in 2022, the techniques used are Amazon Web Services EC2 services, My SQL, GPS. Some of the advantages are that if the hospital is facing any issue the admin can hide the database to maintain the integrity of the user database. The limitations which were faced while operating the website the admin may face some certain system problems, which may cause the uncertainty while managing the blood record and the database users. [9]
- Advanced Blood Management System Community Method on Deep Learning published in 2022 the techniques used is Deep learning where it provides the opportunities to choose the best and most relevant donors to donate to the requested recipient,using Artificial intelligence and machine learning to address problems with rare blood types. The limitation is that the system only makes the blood available in bags and not from the donor [10].
- Implementation of a secure Cloud Computing based framework for the blood blank which was published in 2018 the techniques used are PaaS Platform as a Service, easy host control protocol, NoSQL, Global positioning System. The advantages of this framework is improves the communication between system and the users, the requester will be able to see the position of closest blood bank thanks to GPS technology; a database holds all of the details regarding the location of the blood bank, also tells about the available blood group and the information about the donors and the recipient will be updated dynamically the the database.[11]

III. Technologies Used

- PaaS: PaaS stands for Platform as a service, it provides a platform to create, run, develop, test, deploy their application. End users can purchase these applications from cloud service providers on pay-as-per-use basis and access them using internet connection and without worrying about managing the infrastructure of the application.[12]
- AWS Lightsail : A private virtual server(VPS) provider, AWS Lightsail is the simplest method for developers, small business, and students to get started with AWS when they need a way to create and run their application on the cloud. It gives developers access to computers, networking, storage and other resources they need to set up and maintain a cloud-based website. With virtual machines, containers, databases, CDN. Load-balancer and DNS administrator for an affordable monthly cost, lightsell facilitates a speedy project launch.[13]
- Python: Python is a dynamic, interpreted language. Because of its syntax, python allows programmers to write programmes in fewer lines than some other language. In today's age python is emerging in cloud computing it allows us to rapidly deploy the services irrespective of platform use. Python can perform the data backup, storage and data-recovery, demand based software delivery, development of services and application. The features of python like fast data delivery, fast cycle for deployment, integrated databases, and easy to understand. For instance Python is used in google cloud to perform cloud logging, Monitoring of cloud, Tracing cloud, Reporting errors in cloud.[14]

IV. EXISTING SYSTEM

The aim of [7] is to develop a system with a point of view to close the gap between donor, recipient and blood bank. It is an organized approach where a user has an option to login as user, donor or an admin. if user selects the receptor option then he has to provide information like name, mobile no, adhar card no, email, gender and blood group, if he chooses donor he has to provide information like name, address, mobile, adhar card no, email, blood group or if he chooses Admin his information is always stored in database and he is required to provide correct name and password, upon entering the information he will be able to modify the application. Upon using this application the user can directly check about blood availability which reduces efforts of going to blood banks.

The goal of [8] is to develop a website that is easy to use with various features like locating blood banks near to us, sharing location with sharing button, it provides a direction to desired blood bank through integrated Google map button and hyperlink to contact that blood bank. The prime feature is real-time updating of blood units at the blood bank. Once the User completes the registration process, the system will provide the user with a donor id via email service, if the request is sent for a particular blood type and registration ID is created, however the system will automatically cancel the registration ID and update the blood bank if the user is unable to appear. the administrator can add multiple blood banks and verify if each blood bank is operational. In this system, Database is used to record and manage blood transactions.

The research in [9] is focused towards a system developed which describes user flow and data flow. Initially, User is provided with a website where the user has to create an account, if they already have created an account then they must log in. The user is then provided with the donor's personal data. The user can be a recipient or admins. The system provides functionalities as per log in , if the user logs in as a requester then he directly makes a request for a specific blood group , the partners are provided with different functionalities they can delete, update and view their inventories

The objective of [10] is to make quality blood bags available at any point of time, to maintain proper record of donors and their blood activities, to identify location of blood bags for users when there is an emergency. To use this system, users and hospitals have to create an account and register portal and then login with credentials. the hospital can add blood available in their inventory on the portal and can accept and reject the request for blood. The login details are maintained inside the MySQL database along with receiver and hospital details like city, name, phone number, address. If the Hospital is facing some issue the admin can hide them database to avoid unwanted requests.

In [11], a Web Mobile Application based on the concept of sustainable Blood Bank Management system is developed, it contains four major parts and the main element of the system is blood donors, patients, hospitals and blood donation camps. They have followed the social media approach to build a system where they developed a wall similar to for you page in any social media platform where requests made by patients and announcements made by donors are presented and then Social media shares the post, and if any hospital verifies it, it receives a verified sign. Additionally, this system has a separate emergency requirement unit that is managed by an algorithm based on machine learning.

V. PROBLEM STATEMENT

In India, the existing blood donation and distribution system face significant challenges, which leads to inefficient blood inventory management, insufficient donor engagement, and delayed emergency response. There is a critical need for a comprehensive solution that uses modern technology to address these issues and enhance the healthcare system. This project aims to develop a Cloud-based Blood Bank management system using Amazon Web services to establish a dynamic, secure platform. The system should enable real-time tracking of blood inventory levels, streamlined donor engagement, predictive inventory optimization and rapid emergency response. The solution should handle data protection regulation, ensure user friendly interface for diverse stakeholders. By addressing these challenges the project seeks to transform blood donation scenarios in India, ensuring consistent, accessible, responsive blood supply for medical emergencies and patient care.

VI. SYSTEM ARCHITECTURE

Algorithm 1: Blood bank database searching algorithm

- Start
- Establish Database connection,
    - If yes Go to step e

- Else terminate script and display error message

- Define search parameters
- Construct SQL query
- Prepare SQL statement
- Bind Search Parameters
- Executer prepared statement
- Get results
- If results found
  - go to next step,
  - Else display “No result found” and proceed to step 13 (Close Connection)
- Process each row inside the loop.
  Extract donor ID, blood type and last donation date
  Display donor information
- End loop
- Close prepared statement
- Close connection
- End

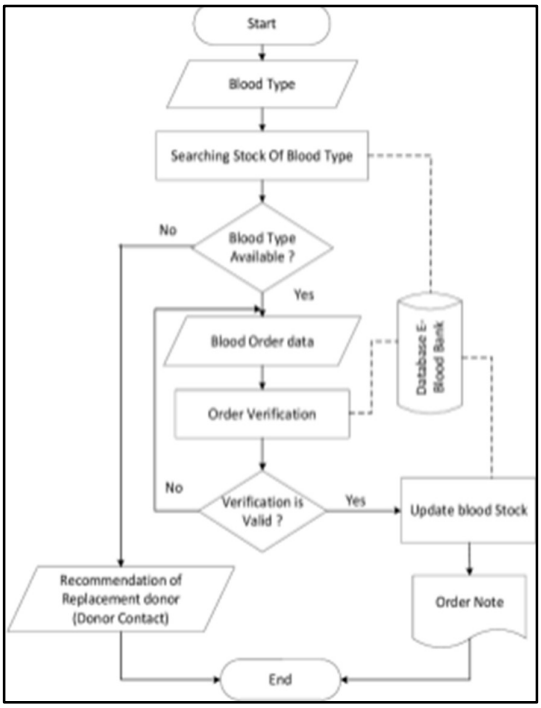

Fig 1. System Flow Diagram

VII. IMPLEMENTATION

For the implementation of our dynamic blood bank management system, we have chosen to host a Python application on Amazon Web Services (AWS) Lightsail. AWS Lightsail provides an intuitive and cost-effective platform for deploying web applications with minimal setup complexity. We have developed the blood bank management system using Python, taking advantage of the language's versatility and extensive libraries for web development. The application includes a user-friendly web-based interface for blood bank staff to manage donor records, track blood inventory, and record transactions. We have utilized popular Python web frameworks like Flask or Django to streamline the application's development.[4] AWS Lightsail offers a simplified environment for deploying Python applications. We have created a Lightsail instance, selecting a specific operating system and plan based on our system requirements. This instance hosts our Python application and ensures its availability to users. The system's database, where donor information, blood inventory, and transaction records

are stored, is hosted on Lightsail, utilizing either a relational database management system (RDBMS) or a NoSQL database, depending on the specific requirements. We have implemented secure access controls and data encryption, making use of Lightsail's built-in security features to protect sensitive information. Additionally, we've configured automatic backups to ensure data integrity and availability. Our implementation follows best practices for AWS Lightsail, providing a scalable and reliable platform for our dynamic blood bank management system. This setup not only simplifies deployment and management but also ensures cost-efficiency and optimal performance for our application. It's a testament to the power of AWS Lightsail in hosting Python applications for critical healthcare solutions.

VIII. USER INTERFACE

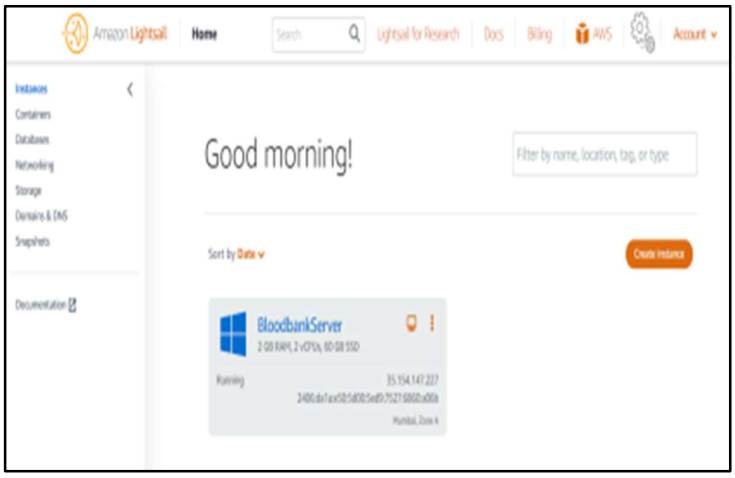

Figure 1. Lightsail dashboard

Fig 1 shows Dashboard for the Lightsail which shows a greetings ‘Good Morning’. Aws Lightsail is a service to which we have uploaded the Blood Bank Server for accessing. The image above suggests that the computer software is ready for utilization.

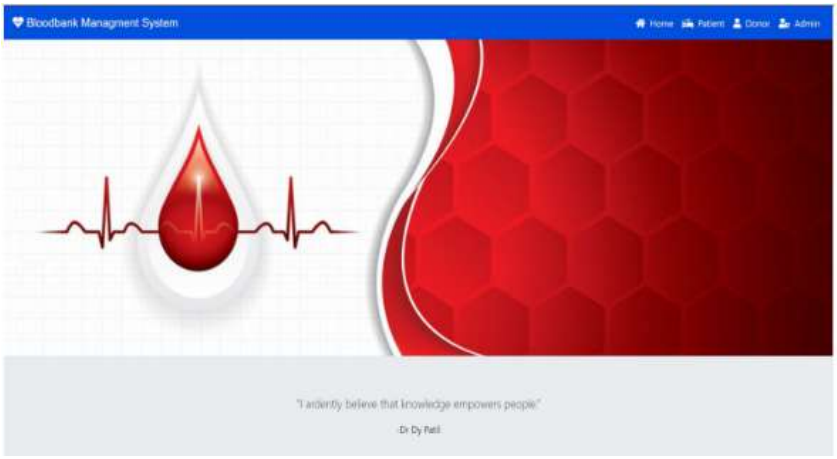

Figure 2. Homepage

In Fig 2, we can see the Homepage of the blood bank management system. Through this page an individual can use the system as Patient for blood donation location near to the patient’s location , Donor who wishes to donate their blood and will be provided with blood donation camp based on their location or Admin who can manage both patient and admin side.An admin has ability to delete and manage the patients and donors information. For accessing the respective system, individuals have to sign up if they are new users or log in with correct credentials.

Figure 4. Active moderation of blood bank

Fig.4 shows blood inventory levels.The following blood kinds and their quantities are displayed by the system: Positive numbers A (A+) = 1000, B positive (B+) = 500, and AB positive (AB+) = 1465. A negative(A-) = 209, B negative (B-) = 8000, O negative (O-) = 290, and AB negative (AB-) = 5000.Additionally, there is a section labeled "Approved Requests," which has one. It also displays the total blood volume (18365 units) and the total number of donors (3).

IX. Conclusion

Our goal has involved innovating and transforming to modernize the regular blood bank management system. In order to solve particular issues faced by blood banks, we designed a dynamic blood bank management system hosted using AWS Lightsail. In conclusion, this dynamic blood bank management system hosted on AWS Lightsail aims to improve the healthcare sector. It depicts how technology can be used to improve health issues not just in India but around the world. This Dynamic Blood Bank Management System is a step towards developing a system that is easily accessible, effective and dependable and assures to have a big impact on the Healthcare industry.

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