Secure Web-Based Blood Bank Management System Using Cloud Computing

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Abstract-
Blood banks, which collect, process, and provide blood to hospitals and clinics in need, are crucial healthcare organizations. The manual techniques used in traditional blood bank management are prone to mistakes, inefficiency, and delayed operations. This study suggests using cloud computing to administer blood banks and raise their general effectiveness and efficiency. An internet connection is required for this project. Nearly every surgical procedure requires the use of blood. The number of people who require blood is rising daily as a result of advances in science and technology, yet there are still issues with blood scarcity and non-availability. Until a suitable blood management system is established, encouraging individuals to donate blood won't be of much use. To what end this project, all blood donation and receiving issues will be resolved for the public in a single location and with a single click. The website will incorporate all of this information online, saving time and being a huge benefit, from registering a person to donate blood to searching for nearby blood banks to check the availability of blood. The donor will be prompted to upload a photo as part of the registration process. The numerous modules that make up this system maintain track of blood donations, blood demand, and hospitals. A large number of blood donors will be drawn to our website. Because they enable central, quick access to donor data, cloud-based systems can be helpful in emergency blood supply and position from almost any location and gadget. The time spent looking through blood banks and hospitals for the necessary blood is significantly shorter thanks to this programme. As a result, this application gives the necessary information more quickly and aids in making decisions. In essence, it fills the space between the giver and the recipient. It offers better blood preservation and management.

1. Introduction
A blood bank is a financial institution or a place of storage where blood is gathered, conserved, and used as needed or requested. Everyone is aware that paperwork is a part of the conventional blood bank administration system. In times of crisis, its method of operation is insufficiently effective. The primary goal of developing a cloud-based blood bank system is to provide individuals with timely access to blood, even in dire circumstances. Known as a pilot project, the project blood bank management system was created to help the blood bank collect blood from a variety of sources and distribute it to those in need who have high blood-supply requirements. The software is made to manage the blood bank's everyday operations and conduct information searches as needed. Registering donor information, blood collection information, and blood issued reports is also helpful. The software application has been created in a way that it can accommodate all blood bank requirements in the future.

The healthcare system is not complete without blood banks. By gathering, processing, and distributing blood and its constituent parts to hospitals and clinics, they play a vital part in saving lives. The conventional approaches of manage blood banks, however, are prone to mistakes and inefficiencies. The effectiveness of blood banks is hampered by the use of manual procedures, paper-based data, and delayed operations, which can cause serious issues with blood supply and distribution.

The management of blood banks can be made substantially more productive and efficient by implementing cloud computing. Data centralization, immediate information access, and increased stakeholder cooperation are all made possible by cloud computing. Cloud computing can enhance blood bank management by reducing human errors, increasing efficiency, and improving data accuracy. Systems used by online blood banks are essential. It makes it easy for the person looking for it by providing information on the closest blood bank, the blood groups that are available, and whether the required quantity is accessible. The hospital, the administrator, and other users are three potential system users who could be involved in this programme (us who owns the product) and the recipient of blood. The three fundamental functions of blood banks that are examined in this study are donor registration, inventory monitoring, and monitoring of the distribution of blood bags or other products.

2. Technology

2.1 Technology Used for Web Application

This application is created using HTML CSS and JavaScript for Front-End of the application and PHP for the Back-End of the application.
2.2 Database
This system uses a database to keep track of and manage the blood donation and blood distribution transactions. This system's primary objective is to maintain a well-organized system for managing blood records. Databases are used to maintain information about donors, blood collection, screening, component preparation, blood storage, blood requests, compatibility, blood issues, and monthly statistics records. It greatly facilitates the appropriate monitoring of the blood supply in the blood bank as well as the quick processing of blood requests.

2.3 Cloud Services Used For Hosting
Blood bank management using cloud computing we are using aws as service provider. List of services are given below:

I. EC2
Scalable computing power is offered by Amazon Elastic Compute Cloud (Amazon EC2) in the Amazon Web Services (AWS) Cloud. By using Amazon EC2, you can develop and deploy apps more quickly because you won't need to make an upfront hardware investment. Launch as many or as few virtual servers as you require, set up networking and security settings, and control storage using Amazon EC2. You can scale up or down with Amazon EC2 to manage variations in demand or popularity spikes, which eliminates the need to predict traffic.

II. ELB
Elastic Load Balancing (ELB) automatically distributes incoming application traffic across multiple targets and virtual appliances in one or more Availability Zones (AZs).

III. ROUTE53
Amazon Route 53 is a highly available and scalable Domain Name System (DNS) web service. Route 53 connects user requests to internet applications running on AWS or on-premises.

IV. RDS
A group of managed services known as Amazon Relational Database Service (Amazon RDS) makes it simple to set up, run, and scale databases in the cloud. Choose one of seven well-liked engines — MySQL, MariaDB, PostgreSQL, Oracle, and SQL Server — and deploy it on-premises using Amazon RDS on AWS Outposts. Amazon Aurora also supports PostgreSQL and MySQL.

3. Existing System
The functioning of the blood bank system is described in the information gathered from hospitals and blood banks. In a lab, blood cannot be created artificially. Thus, blood collection needs to be increased to meet the growing need. While the volume of blood in the bank depends on a number of donors, the blood bank and hospitals execute a variety of promotional initiatives to encourage donors to donate blood. Following their blood donation, donors acquire and keep information such as their phone number, email address, and other contact details. The paperwork-based system in use today is essential. The donor and recipient must fill out a form with the necessary information in order to donate and receive blood from the bank. It creates room for errors as the data is entered manually by the persons. It includes the risk of the documents being lost over years and maintenance of the records is difficult. Maintaining the stock of blood and the daily transactions without computerization also poses a challenge.
4. Proposed System

The system architecture that outlines the data processing flow. The webpage where users must register themselves will be presented to them. They can immediately log in and use the system if they had already registered. The system will handle the data in accordance with the type of login, so a typical user login allows them to directly enter their request, which will then be handled as quickly as feasible. Users have the option to profile and update their blood bank information if they log in as a hospital or blood bank. If the needed information is not readily available, the website additionally gives users access to donors' personal information. The system's user is the first step in the physical architecture of the system's operation. Each time a user wants to access the system, he can access the system by entering their login information. The Requester looking for the appropriate blood group, the system administrator, or the partners connected to the system might all be considered system users. The system offers the user varied capabilities depending on his login when he logs in to use the system's features.

**Patient:** If the user logs in as a patient, he or she can request the necessary blood group directly. Following receipt of the request, the control is transferred to a cloud-based database to determine whether the requested blood group is accessible or not. If the blood group is known, information about it is sent to the user as soon as possible.

**Donor:** If donor doesn’t have an account he can register and then login into system. Donor can add as well as request blood whenever required.

**Admin:** Admin is the important part of the system. Whenever the admin login to the system he is allowed all the access right to the database stored in the cloud. He is the person responsible for handling the efficient working of the system. In case any problem arises the admin must try to resolve it and make system work again.
4.1 AWS Architecture for Blood Bank Management System

The donor registration, patient registration and blood bank database are all managed by the blood bank management system, a web-based application. The application is set up on Amazon Web Services (AWS) in two availability zones to achieve fault tolerance and high availability (AZs).

Architecture Overview

The architecture of the blood bank management system on AWS consists of the following components:

- Two Availability Zones
- One public subnet in each AZ
- One private subnet in each AZ
- EC2 instances for web application and database servers
- Application Load Balancer
- Route 53
- NAT Gateway
- Internet Gateway
- Auto scaling group

The following diagram shows the architecture of the blood bank management system on AWS:
Components of AWS Architecture Diagram

1. **Availability Zones**
   The blood bank management system is deployed in two availability zones (AZs) to ensure high availability and fault tolerance. Each AZ contains one public subnet and one private subnet.

2. **Public Subnets**
   The public subnets are located in each AZ and contain an EC2 instance that hosts the web application and a NAT Gateway. The web application is accessible from the internet through Route 53 DNS service to the EC2 instance. The NAT Gateway allows the instance in private subnet to securely access external resources, such as databases and APIs, without exposing them to the public internet.

3. **Private Subnets**
   The private subnets are also located in each AZ and contain an EC2 instance that hosts the database server. The database server is accessible only from within the VPC and is not directly accessible from the internet. The security groups are configured in such a way that it will only accept request from EC2 instance in public subnet.

4. **EC2 Instances**
   The blood bank management system on AWS includes two types of EC2 instances: web application and database servers. The web application servers are located in the public subnets and host the web application, while the database servers are located in the private subnets and host the database.

5. **Application Load Balancer**
   The application load balancer distributes incoming traffic across the EC2 instances hosting the web application. It improves the availability and fault tolerance of the application by redirecting traffic to healthy instances in the event of a failure.

6. **Route 53**
   Route 53 is a DNS service that enables users to route traffic to AWS resources. The blood bank management system uses Route 53 to route incoming requests to the application load balancer.

7. **NAT Gateway**
   The NAT Gateway is a service that allows the web application to securely access external resources, such as databases and APIs, without exposing them to the public internet.

8. **Internet Gateway**
   The internet gateway provides a path for incoming and outgoing traffic between the VPC and the internet. It enables the web application hosted in the public subnets to be accessible from the internet.
4.2 Graph and Location System

The link between lines and points is described by a graph, which is a mathematical description of a network. A graph is made up of some points and the connecting lines. It doesn't matter how long the lines are or where the points are located. A node is the name for each element in a graph.

The visual display of data (often grouped) in the shape of vertical or horizontal rectangular bars, with the length of the bars corresponding to the measure of the data, is called a bar graph. Bar charts are another name for them. One tool used in statistics for processing data is the bar graph.

The number of blood units present in the blood bank is represented in this blood bank system by a bar graph. The user can represent or view the blood units that are in the blood bank and can indicate whether or not the amount of blood that they need is in the bank.

If the user choose to visit the blood bank on their own, they can also see where the nearby hospitals are located. The user will be taken to a website where the names of hospitals and their locations are listed as soon as he requests a location. The user will be taken to Google Maps.
when he or she clicks on the location tab of a certain hospital, where they may view the hospital's location, route, and distance from their current position.

5. Literature Survey

<table>
<thead>
<tr>
<th>No</th>
<th>Paper Title</th>
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<th>Year</th>
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<th>Disadvantages</th>
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<tr>
<td>1</td>
<td>Blood Bank Management System using Cloud</td>
<td>Mr. Shreyas Anil Chaudhari, Ms. Shrutika Subhash Walekar, Ms. Khushboo Ashok Ruparel</td>
<td>2018</td>
<td>E-Blood Bank System based on latest technology of cloud computing is proposed</td>
<td>This project mainly aims to solve the problem by tracking these donors with the help of cloud.</td>
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<tr>
<td>2</td>
<td>Online Blood bank Management System</td>
<td>Chetan Masram, Arshad Mulani, Rasika Bhitale, Jidnesh Koli</td>
<td>2021</td>
<td>This project, propose an efficient and reliable blood donor information</td>
<td>There is no proper care of a person who donates blood to patients. i.e. there is no information about the person who has donated.</td>
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</table>
6. Result and Discussion

The results of the literature review showed that the implementation of cloud computing in blood bank management can bring several benefits, including:

- **Improved accuracy of data**: The centralization of data and real-time access to information can reduce manual errors and improve the accuracy of data.
- **Increased collaboration between stakeholders**: Improved collaboration between different stakeholders can help to speed up operations.
- **Enhanced data security**: The use of cloud computing technology can help to enhance the security of sensitive information.

The use of cloud computing in blood bank management does have certain drawbacks, though, including the expense of deployment, the requirement for technical know-how, and the possibility of data breaches. To ensure the successful application of cloud computing in blood bank management, certain constraints must be addressed and overcome.
Blood Request

Requested Blood
7. Conclusion
The administration of blood banks can gain a lot from using cloud computing, including better data accuracy, increased stakeholder engagement, and improved data security. To ensure the successful application of cloud computing in this industry, the drawbacks of cloud computing in blood bank management must be addressed and overcome. An online blood management system is a condensed solution to the issues with the current blood flow procedure that seeks to eliminate the barriers to having top-notch and hassle-free blood transfer.
In conclusion, the blood bank management system deployed on AWS using EC2 instances, NAT gateway, application load balancer, Route 53, and internet gateway is a highly available, fault-tolerant, and secure solution that can handle sudden traffic spikes and optimize resource utilization. By leveraging the power of cloud-based technologies, blood banks can efficiently manage their inventory and provide life-saving blood transfusions to those in need.

8. Future Research
The system's current service must be continued in the future together with SMS services. This SMS service will be helpful for those in areas where people are still without internet access. The seeker will send an SMS to the giver. The seeker's contact information will be encoded in some other way. The primary objective is to offer a blood bank without internet connection.
Future studies should concentrate on examining the practical application of cloud computing in blood bank management and assessing its effects on blood banks' productivity and efficacy. Also, this study should look at the restrictions and difficulties encountered while implementing cloud computing in blood bank management and offer suggestions for resolving these issues. The advancement of technology in today's world makes it simple to complete a task quickly. As a result, the online portal we created enables individuals to request blood as needed, and hospitals to provide details about which blood groups are available in their inventory so that they can update this information on the portal. You can access the portal both online and by everyone as we are using amazon ec2 service for the deployment of our application.
9. References


