

A PROJECT REPORT
ON
“PM RELIEF FUND MONITORING SYSTEM USING BLOCKCHAIN”
SUBMITTED IN PARTIAL FULLFILLMENT OF THE
REQUIREMENTS OF DEGREE OF
BACHELOR OF ENGINEERING
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Certificate

This is to certify that the Major Project-I entitled “**PM Relief Fund Monitoring System Using Blockchain**” is a bonafide work of Anushka Kadam, Pratiksha Khemnagar, Viraj Kadam submitted to the University of Mumbai in partial fulfilment of the requirement for the award of the degree of “**Undergraduate**” in “**Computer Engineering**”.

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Declaration

We declare that this written submission represents our ideas in our own words and where others ideas or words have been included. We have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will because for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Abstract

In India, there is lack of transparency in charities funds. Funds released to respective department for the welfare of societies are difficult to monitor by the higher authorities, because of this, higher authority is unaware of what their officials are doing with funds. So to stop such corrupt activities we need to bring transparency in every transaction, and this is possible by using decentralized system so stakeholder is aware of every transaction. Aim of the project is to create the Relief Fund Monitoring System based on Blockchain technology. This integrates the transparency in fund transfer. System composed in Solidity programming language and are stored on Ethereum public blockchain, this enables automatic execution under specified conditions.

Keywords: *higher authority, decentralized, transparency, blockchain*

Abbreviations

1. PM – Prime Minister
2. CMDRF - Chief Minister's Distress Relief Fund

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Chapter 1

Introduction

1.1 Background

The landscape of disaster management has evolved significantly in recent years, driven by a growing recognition of the need for more effective, transparent, and accountable systems. Natural disasters such as floods, earthquakes, and pandemics can devastate communities, leaving behind a trail of destruction that necessitates immediate and coordinated relief efforts. Traditionally, relief efforts have relied on government agencies and non-profit organizations to manage funds, allocate resources, and ensure that aid reaches those in need. However, these processes often face numerous challenges, including bureaucratic inefficiencies, lack of transparency, and difficulty in tracking fund utilization. Such issues can hinder the timely delivery of assistance, ultimately exacerbating the suffering of affected populations.

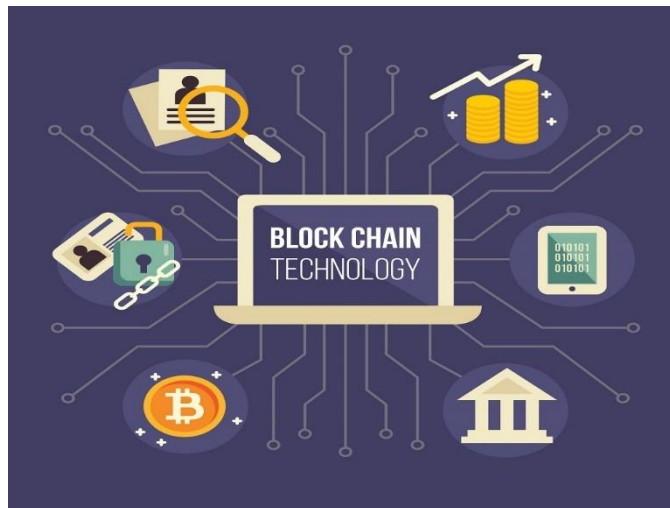


Figure 1.1. Blockchain Technology

Blockchain technology has emerged as a transformative force in various sectors, including finance, supply chain management, and healthcare, and offers a promising solution to the challenges faced in disaster relief. Blockchain is a decentralized, distributed ledger that securely records transactions across multiple computers, ensuring that the data cannot be altered retroactively. This technology provides several advantages, including enhanced transparency, improved accountability, and reduced potential for fraud. By allowing all stakeholders—government entities, non-profits, donors, and beneficiaries—to access real-time data on fund allocation and usage, blockchain fosters a level of trust that is often missing in traditional systems.

In India, the government has established various relief funds to assist citizens during times of crisis, including the PM CARES Fund, which was created to address the urgent needs arising from the COVID-19 pandemic. While these funds aim to provide timely assistance, their effectiveness is often undermined by the lack of visibility into how the funds are managed and distributed. For instance, beneficiaries frequently encounter bureaucratic hurdles that delay the application and approval processes, while stakeholders may have little insight into the actual flow of funds. As a result, the need for a more transparent and efficient system is evident.

The PM Relief Fund Monitoring System aims to address these challenges by integrating blockchain technology into the management of relief funds. This system will facilitate the submission, verification, and disbursement of relief funds in a way that is transparent and accountable. By employing a decentralized ledger, the system allows for real-time tracking of fund flows, enabling all stakeholders to see how funds are allocated and utilized. Additionally, incorporating machine learning algorithms for document verification and eligibility assessment will streamline application processes and ensure that assistance is directed to those who need it most.

By creating a robust and transparent system for disaster relief fund management, the PM Relief Fund Monitoring System not only aims to improve the efficiency of aid distribution but also to rebuild public trust in the relief process. This initiative has the potential to set a precedent for future disaster response efforts in India and globally, ultimately fostering a more resilient and accountable approach to managing relief funds. The adoption of such innovative technologies is essential for enhancing the effectiveness of relief operations and ensuring that aid reaches those who need it most in a timely and efficient manner.

1.2 Motivation

The motivation for developing the PM Relief Fund Monitoring System is rooted in the pressing need for a more effective and transparent approach to disaster relief management. Natural disasters—such as floods, earthquakes, and pandemics—expose the vulnerabilities of communities, often resulting in devastating consequences for those affected. In such scenarios, timely access to aid and support can be the difference between life and death. However, traditional mechanisms for managing relief funds frequently fall short due to inefficiencies, corruption, and bureaucratic obstacles. These shortcomings can lead to delayed disbursements, misallocation of resources, and a general erosion of public trust in governmental and non-governmental organizations tasked with providing aid. The increasing prevalence of such challenges highlights the need for a system that guarantees accountability and transparency in fund management. Blockchain technology offers a solution by providing a decentralized and immutable ledger that records every transaction related to fund allocation and distribution. This technology not only mitigates the risk of fraud but also allows for real-time tracking of funds, enabling stakeholders to monitor how resources are allocated and utilized. The transparency afforded by blockchain can significantly enhance public confidence in the relief process, ensuring that donors and beneficiaries alike can verify that funds are being used effectively and efficiently. Moreover, implementing a blockchain-based system can streamline the administrative processes involved in disaster relief, reducing the time it takes for funds to reach those in need.

In addition to the technical advantages of blockchain, the PM Relief Fund Monitoring System seeks to address the complexities surrounding eligibility verification and application processes. Often, beneficiaries face bureaucratic hurdles that complicate their access to aid, leading to further delays and frustration. By incorporating machine learning algorithms, the system aims to simplify these processes, ensuring that applications can be assessed quickly and accurately. This dual approach—combining blockchain for transparency and machine learning for efficiency—presents a comprehensive solution to the challenges faced by both relief organizations and beneficiaries. Ultimately, the motivation behind the PM Relief Fund Monitoring System extends beyond mere technological innovation; it reflects a commitment to enhancing the quality of life for individuals affected by disasters. By creating a more efficient and accountable framework for disaster relief, this initiative seeks to empower communities, rebuild trust in aid organizations, and serve as a model for future relief efforts. In doing so, the project aspires to not only alleviate immediate suffering but also to contribute to long-term resilience and recovery for vulnerable populations in India and beyond.

1.3 Organizations of Report

This report is organized into the following chapters:

Chapter 1: Introduction – Provides the background of the project, motivation for developing a PM Relief Monitoring system, and the objectives of the study.

Chapter 2: Literature Survey – Reviews fundamental concepts of blockchain, existing centralized systems, and outlines the problem statement and scope of the project.

Chapter 3: Planning and Requirement Gathering – Discusses software and hardware requirements, the project plan illustrated by a Gantt chart

Chapter 4: Project Analysis – Includes analysis diagrams such as data flow diagrams, use case diagrams, and sequence diagrams to illustrate system interactions.

Chapter 5: Project Design – Details the design of the system, featuring state transition diagrams and swim lane diagrams to outline workflows and processes.

Chapter 6: Proposed System – Describes the architecture of the proposed system and the methodology used for implementation.

Chapter 7: Conclusion – Summarizes the findings of the project and suggests potential improvements and future work.

Chapter 2

Literature Survey

2.1 Fundamental Concepts

Blockchain Technology: A decentralized, distributed ledger that records transactions across multiple computers. Each transaction is linked to previous ones in a secure and immutable manner, enhancing transparency and trust.

Admin: Administrators oversee the entire relief fund management system, ensuring that processes run smoothly. They handle the verification of beneficiary applications, monitor fund disbursements, and ensure compliance with regulatory standards.

Donor: Individuals or organizations that contribute funds to the relief efforts. They play a vital role in providing the necessary resources for aid distribution and require assurance that their contributions are used effectively and transparently.

Beneficiary: The individuals or communities that receive aid and support from the relief funds. Ensuring that beneficiaries have easy access to assistance and that their needs are accurately assessed is crucial for the effectiveness of the relief effort.

Smart Contracts: Self-executing contracts with the terms of the agreement directly written into code. They automatically enforce and execute actions when predetermined conditions are met, streamlining processes and reducing the need for intermediaries.

Transparency: The ability for all stakeholders to access real-time data regarding fund allocation and usage. This fosters trust among beneficiaries, donors, and regulatory bodies by ensuring accountability in how resources are managed.

Decentralization: The distribution of authority and control across a network rather than being concentrated in a single entity. This reduces the risk of fraud and mismanagement by eliminating single points of failure.

Immutability: Once recorded, transactions on the blockchain cannot be altered or deleted. This characteristic ensures the integrity of data, making it reliable for auditing and historical reference.

Cryptography: The use of encryption techniques to secure data on the blockchain, ensuring that only authorized parties can access and modify information. This protects sensitive data from unauthorized access and cyber threats.

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Traceability: The ability to track the flow of funds from their source to their ultimate destination. This feature ensures that every transaction is accounted for, promoting accountability and reducing opportunities for misappropriation.

Fund Allocation and Distribution: The processes by which relief funds are assigned to specific initiatives or beneficiaries and disbursed. Effective allocation and distribution are critical for ensuring timely support to those in need.

Public Trust: The confidence that the public has in the system's ability to manage funds responsibly and transparently. Building public trust is essential for encouraging donations and participation in relief efforts.

2.2 Existing system

The existing systems for managing disaster relief funds often rely on traditional bureaucratic processes that can be inefficient and lack transparency. These systems typically involve multiple stakeholders, including government agencies, non-profit organizations, and local communities, each playing a role in fund allocation and distribution.

Some of the existing systems are as follows:

1 PM CARES Fund

The PM CARES (Prime Minister's Citizen Assistance and Relief in Emergency Situations) Fund was established in March 2020 by the Government of India to provide a dedicated fund for combating and mitigating the impact of COVID-19 and other emergency situations. The fund aims to support various initiatives, including healthcare infrastructure, relief for affected individuals, and development of essential services during crises. Contributions to the fund are received from individuals, corporate entities, and organizations, and the fund is managed by a trust led by the Prime Minister of India. One of the key features of the PM CARES Fund is its focus on transparency and accountability, with regular disclosures of fund utilization and the specific initiatives supported by the contributions.

2 Chief Minister's Disaster Relief Fund (CMDRF)

The Chief Minister's Disaster Relief Fund (CMDRF) is a state-level initiative in India that aims to provide immediate relief to victims affected by natural disasters such as floods, droughts, and earthquakes. Each state in India manages its own CMDRF, which is established under the Disaster Management Act, 2005. The fund is primarily used for providing assistance to affected individuals and families, restoring essential services, and supporting rehabilitation efforts. The CMDRF typically receives contributions from state budgets, donations from individuals and organizations, and other sources. The fund is governed by guidelines set by the state government, ensuring that aid is distributed fairly and efficiently to those in need during emergencies.

However, several challenges limit the effectiveness of these existing frameworks:

- **Bureaucratic Inefficiencies:** The processes for applying for, approving, and distributing funds are often lengthy and cumbersome. Beneficiaries may face signifi

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delays in receiving assistance due to layers of bureaucracy, which can lead to missed opportunities for timely aid.

- **Lack of Transparency:** Many existing systems do not provide adequate visibility into how funds are allocated and utilized. This lack of transparency can foster mistrust among beneficiaries and donors, who may question the integrity of the process and the management of resources.
- **Difficulty in Tracking Fund Utilization:** Without a robust tracking mechanism, it becomes challenging to monitor the flow of funds from allocation to disbursement. This can result in misappropriation of resources or funds being directed to unintended beneficiaries, undermining the effectiveness of relief efforts.
- **Inconsistent Eligibility Criteria:** The criteria for determining eligibility for assistance can vary significantly between different agencies and regions. This inconsistency can create confusion for beneficiaries and may lead to qualified individuals being overlooked or denied aid.
- **Limited Accessibility for Beneficiaries:** Many existing systems do not effectively engage with beneficiaries, making it difficult for them to access information about available aid or the application process. This lack of accessibility can result in eligible individuals being unaware of their entitlements or facing challenges in navigating the system.
- **Reliance on Manual Processes:** Existing systems often depend on manual data entry and verification, which increases the risk of errors and delays. This reliance on traditional methods can hinder the efficiency of fund management and complicate the auditing process.
- **Insufficient Stakeholder Collaboration:** The absence of a cohesive platform for collaboration among stakeholders can lead to duplicated efforts and a lack of coordination in disaster response. This fragmentation can limit the overall effectiveness of relief operations and diminish the impact of the funds distributed.

2.3 Problem Statement

The proposed blockchain-based relief fund monitoring system addresses critical issues in current relief distribution mechanisms by offering a transparent, efficient, secure, and accountable solution. Existing systems often suffer from bureaucratic inefficiencies, leading to delays in aid delivery and misallocation of resources, which exacerbates the suffering of affected communities during emergencies. Additionally, the lack of transparency in fund allocation undermines trust among beneficiaries and donors, discouraging future contributions. By leveraging blockchain technology, the system ensures that all transactions are recorded in an immutable and auditable manner, fostering trust and allowing real-time tracking of funds. Smart contracts automate processes, eliminating intermediaries and reducing bureaucratic delays, while machine learning algorithms can streamline eligibility verification for beneficiaries. This innovative approach not only enhances the effective management and distribution of relief funds but also aims to improve the overall impact of humanitarian efforts, ensuring timely support reaches those in need and restoring public confidence in the relief process.

2.4 Scope of the Project

The scope of the proposed blockchain-based relief fund monitoring system encompasses several key areas, aimed at enhancing the management and distribution of relief funds during emergencies.

1. **Stakeholder Engagement:** The system will facilitate interactions among various stakeholders, including government agencies, non-profit organizations, donors, and beneficiaries, creating a collaborative platform for disaster response. This engagement ensures that all parties are informed and involved in the relief process.
2. **Fund Management and Allocation:** The system will provide tools for efficient management and allocation of funds, enabling administrators to track the flow of resources in real time. This feature will help ensure that funds are directed to the most urgent needs and that allocations are transparent.
3. **Transaction Transparency:** By utilizing blockchain technology, the system will offer an immutable and transparent record of all transactions related to fund distribution. This transparency will enhance accountability and build trust among stakeholders by allowing them to verify how funds are being utilized.
4. **Eligibility Verification:** The integration of machine learning algorithms will streamline the process of verifying beneficiary eligibility, ensuring that assistance is directed to those who genuinely need it. This will help reduce delays and improve the efficiency of aid distribution.
5. **Audit and Reporting:** The system will include features for auditing and generating reports on fund utilization, ensuring compliance with regulatory standards and enabling thorough assessments of the relief efforts. This functionality will enhance accountability and facilitate better decision-making.
6. **Scalability and Adaptability:** The system will be designed to be scalable and adaptable, allowing it to be implemented in various contexts and regions, accommodating different disaster scenarios and stakeholder requirements.
7. **Training and Capacity Building:** The implementation of the system will include training programs for stakeholders to ensure they are equipped to use the platform effectively, fostering a better understanding of the technology and its benefits.

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8. Continuous Improvement: The system will incorporate feedback mechanisms for stakeholders to suggest improvements and enhancements, ensuring it evolves to meet the changing needs of disaster relief operations.

By encompassing these areas, the blockchain-based relief fund monitoring system aims to revolutionize the way relief funds are managed and distributed, ultimately leading to more effective humanitarian efforts and improved outcomes for affected communities.

Chapter 3

Planning and Requirement Gathering

3.1 Software and Hardware Requirements

Here we will discuss everything we will need in order to execute. Below we list the necessary hardware and software requirements.

1. Software Requirements:

- Development Environment: Ganache
- Runtime Environment: node js
- Programming languages: React js, solidity
- Database: firebase

2. Hardware Requirements:

- Processor: Minimum quad-core CPU (Intel i5 or AMD Ryzen 5)
- RAM: At least 8GB (16GB recommended for smoother multitasking)
- Storage: SSD with at least 256GB (512GB recommended)

3. Client-Side Requirements (For End-Users):

- Any modern browser (Chrome, Firefox, Edge)
- MetaMask or another Web3 wallet to interact with the blockchain

1. Project Plan (Gantt chart)

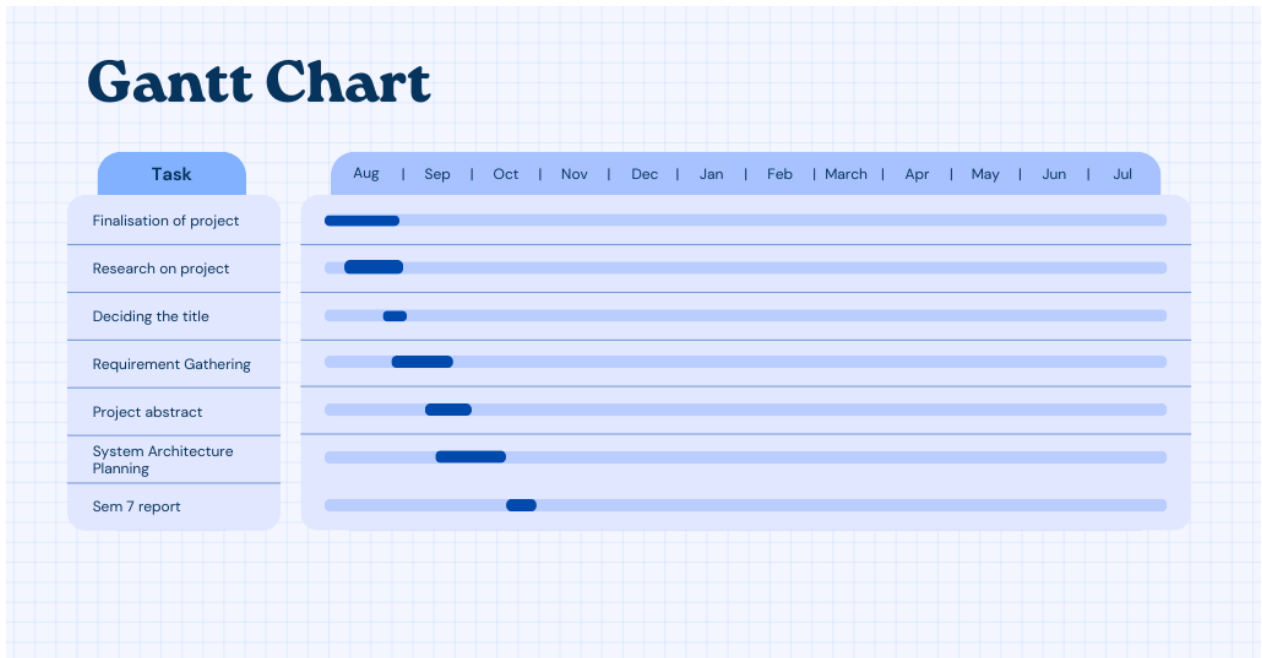


Figure 3.1. Gantt Chart

Chapter 4

Project Analysis

4.1 Data Flow Diagram

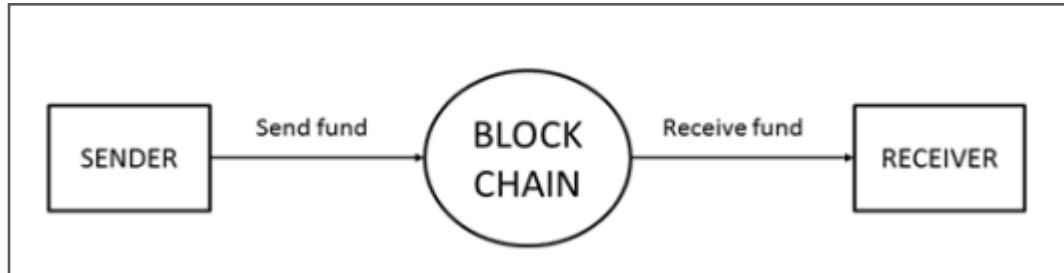


Figure 4.1. DFD Level 0

The DFD Level 0, or Context Diagram, illustrates the blockchain-based relief fund monitoring system as a single process interacting with external entities, including Users, Government Officials, and Admins. The system receives inputs such as user registrations, donations, fund allocation requests, and documentation uploads while producing outputs like transaction confirmations and fund usage reports. This level emphasizes the system's core function of facilitating secure and efficient management of relief funds, ensuring transparency and accountability in disaster response efforts.

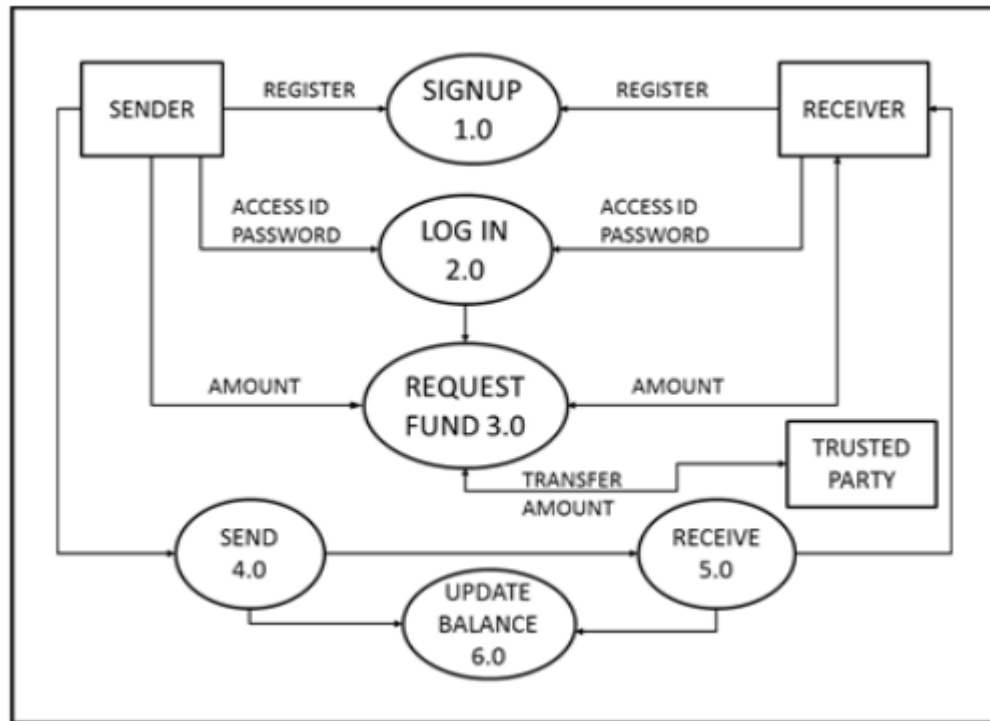


Figure 4.2. DFD Level 1

The DFD Level 1 expands on the core processes within the blockchain-based relief fund monitoring system. It highlights key functions such as User Authentication, Fund Donation, Fund Allocation, and Reporting. Users engage with the system by registering, logging in, donating, and tracking fund usage. Government Officials allocate funds through smart contracts, while Admins upload documentation for verification. This level underscores the importance of real-time updates and secure transactions in maintaining transparency and trust throughout the relief fund management process.

4.2 Use Case Diagram



Figure 4.3 UML

The UML Class Diagram for the blockchain-based relief fund monitoring system defines the structure of key classes such as User, Admin, Government Official, Donation, Smart Contract, and Fund Report. It illustrates the relationships among these entities, showcasing how users interact with the system, manage donations, allocate funds, and generate usage reports. This diagram highlights the roles of different stakeholders and their collaborative efforts to ensure efficient and transparent relief fund management.

Chapter 5

Project Design

5.1 Flowchart

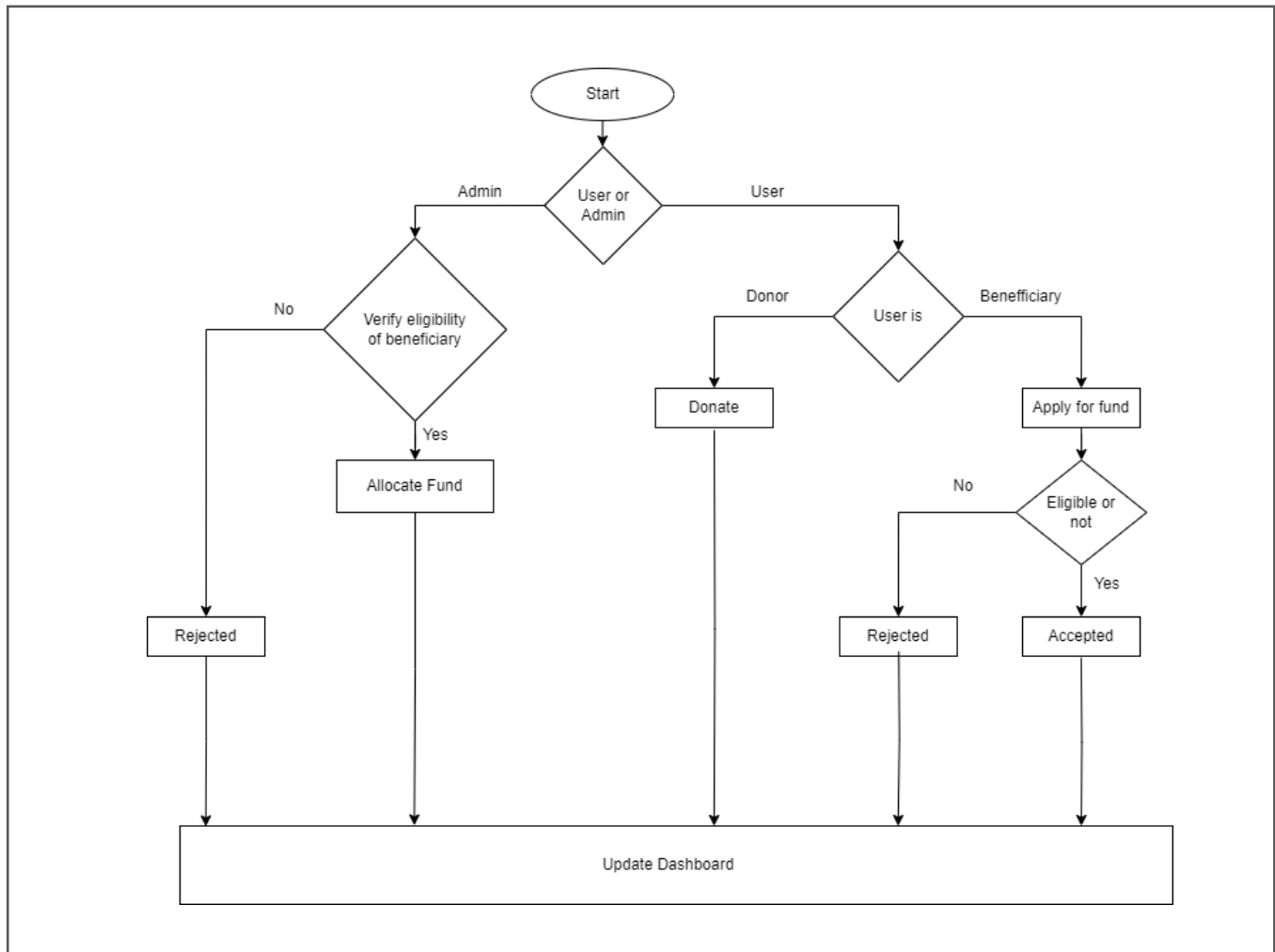


Figure 5.1. Flowchart

The flowchart for the blockchain-based relief fund monitoring system outlines the key steps in the process. It starts with user registration and authentication, allowing users to log in securely. Once authenticated, users connect their cryptocurrency wallets to make donations, which trigger smart contracts for recording transactions. Government officials allocate funds, with real-time updates visible to users. Admins upload documentation of fund usage to IPFS, linked to the blockchain. Finally, users can access reports on fund allocation and track transactions, ensuring transparency and accountability in the relief fund management process.

Chapter 6

Proposed System

6.1 Proposed System Architecture

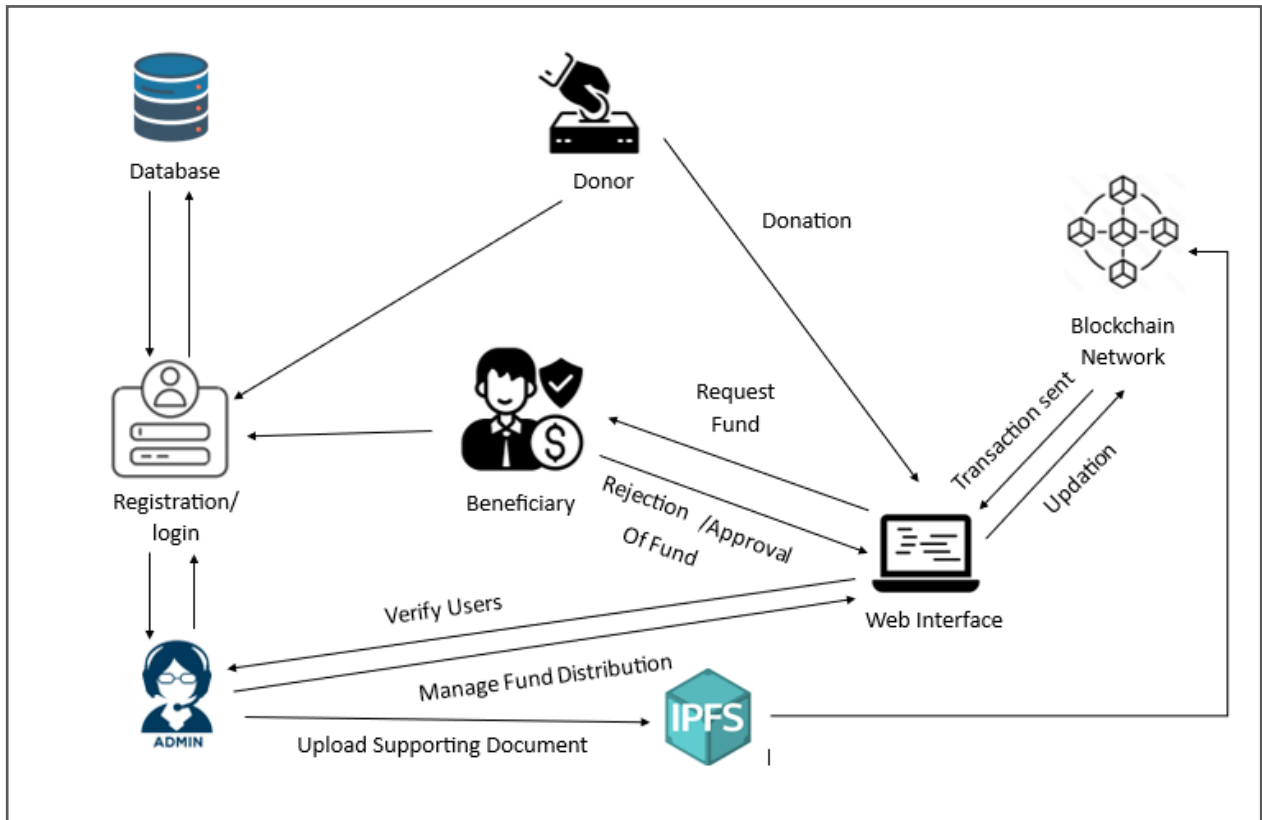


Figure 6.1. Proposed Architecture

The proposed architecture for the blockchain-based relief fund monitoring system comprises multiple layers: the Presentation Layer (frontend in React.js) for user interaction, the Application Layer (backend in Node.js) for business logic and API handling, the Blockchain Layer for smart contract management, the Storage Layer using IPFS for document storage, and the Database Layer (e.g., MongoDB) for managing user and transaction data. This architecture ensures secure, scalable, and efficient relief fund management while facilitating transparency and accountability among stakeholders.

6.2 Methodology

The methodology for developing the blockchain-based relief fund monitoring system is structured around a systematic workflow, encompassing user authentication, fund donation, fund usage and reporting, and user interaction. This methodology ensures the development of a secure, efficient, and user-friendly system that meets the needs of all stakeholders involved.

1. User Authentication

- **Registration and Login:** Users can register on the platform by providing essential details such as their email address and password. Upon successful registration, users can log in to access their accounts.
- **JWT Token Issuance:** Upon successful authentication, a JSON Web Token (JWT) is generated and issued to the user. This token is utilized for secure access to the system's API, ensuring that all interactions are authenticated and authorized.

2. Fund Donation

- **Wallet Connection:** Users connect their cryptocurrency wallets (e.g., MetaMask) to the platform. This enables seamless transactions and interaction with the blockchain network.
- **Donation Process:** Users can donate Ethereum (ETH) or other supported cryptocurrencies through the platform. Upon initiating a donation, a transaction is created, and the user is prompted to confirm the transaction in their wallet.
- **Smart Contract Triggering:** The donation triggers a smart contract, which automatically records the donation on the blockchain. This contract updates the total fund balance and provides a transparent ledger of all contributions.

3. Fund Usage and Reporting

- **Fund Allocation by Government Officials:** Authorized government officials can access the smart contract to allocate funds for specific projects or initiatives. The contract ensures that only eligible personnel can execute these transactions.
- **Smart Contract Updates:** Any changes made by officials in the smart contract are immediately reflected in the user interface, allowing all stakeholders to see real-time updates on fund allocation and usage.
- **Documentation and Reporting:** Admins upload relevant documents or images that demonstrate how funds have been utilized. These documents are stored on the

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InterPlanetary File System (IPFS), providing decentralized and secure storage. Each document is referenced on the blockchain, ensuring that users can verify the usage of funds.

4. User View

- **Fund Usage Reports:** Users can access detailed reports that illustrate how their contributions have been allocated and utilized. This transparency builds trust and encourages further donations.
- **Transaction Tracking:** Users can track all their transactions and the overall fund flow using on-chain data via a blockchain explorer. This feature allows users to see a clear audit trail of their contributions and the impact of their donations on the relief efforts.

5. Technology Stack

- **Blockchain Platform:** The system will utilize a suitable blockchain platform (e.g., Ethereum) to deploy smart contracts and maintain the immutable ledger of transactions.
- **Smart Contracts:** Smart contracts will be written in Solidity, managing fund allocation and ensuring that all conditions for fund usage are met.
- **Decentralized Storage:** IPFS will be used for storing documents related to fund usage, ensuring secure and decentralized access to important information.
- **Frontend Development:** The user interface will be developed using React.js, ensuring a responsive and intuitive user experience.
- **Backend Development:** Node.js will be used for backend development, handling user authentication, API requests, and interactions with the blockchain.

Chapter 7

Conclusion

Conclusion

In conclusion, the blockchain-based relief fund monitoring system offers a groundbreaking solution to the longstanding challenges of managing and distributing humanitarian aid effectively. By addressing critical issues such as transparency, efficiency, and accountability, this system significantly improves the traditional relief mechanisms that often hinder timely assistance. Leveraging blockchain technology ensures an immutable record of all transactions, fostering trust among stakeholders, including donors, beneficiaries, and government agencies. Additionally, the integration of machine learning for streamlined eligibility verification expedites the aid distribution process, reducing bureaucratic delays. Ultimately, this innovative approach not only enhances the effectiveness of disaster response efforts but also empowers affected communities by ensuring that resources are utilized optimally, paving the way for more resilient societies in the face of future emergencies.

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