

ChainSafe : Insurance Management System Using Blockchain



Project Guide : Sreelekshmi K R

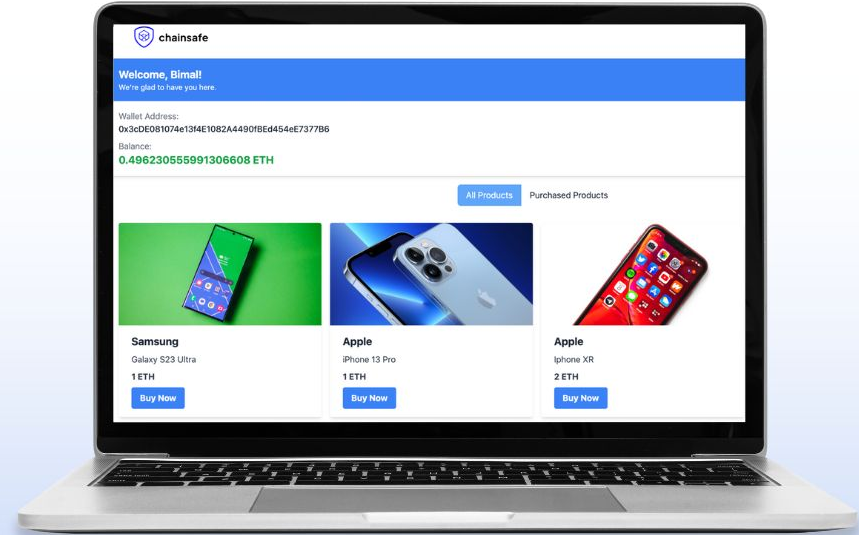
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- ★ Conclusion & Future Scope



chainsafe

Revolutionizing Insurance Through Blockchain

Introduction

- Insurance is vital for safeguarding against financial risks, but it involves intricate regulations and compliance requirements.
- Lengthy and inefficient insurance procedures often cause delays and frustration for policyholders.
- Fraudulent claims are costly for insurance companies and erode industry trust.
- Complex policy terms can lead to misunderstandings and disputes for policyholders.

Introduction

- Manual processes and intermediaries increase insurance costs passed on to policyholders.
- Insurance industry's sensitive data is vulnerable to cyberattacks and breaches.
- Intense competition leads to price wars and cost reduction pressure.
- High premiums due to increased costs and competition.

Objectives

- Demonstrate the potential of blockchain for streamlining insurance claims.
- Automate manual processes and reduce errors through smart contracts.
- Improve operating efficiencies and lower transaction costs with blockchain.
- Increase trust through secure and transparent transaction records.

Existing System

- Traditional insurance relies on a centralized authority.
- Technology has enhanced efficiency and security in insurance through electronic claims processing and automated underwriting.
- A centralized authority for claim processing, leads to inefficiencies and delays.
- Challenges for insurers still exist despite technological advancements.

Literature Survey

Sl.No	Paper	Methodology	Limitation
1	"Implementation of Smart Contracts based on Hyperledger Fabric Blockchain for the Purpose of Insurance Services"[1]	Discusses that the private nature of Hyperledger Fabric makes it a good fit for the insurance industry, as it allows for quick access to information, cheaper transactions, and control over privacy.	Many insurance companies have existing systems and processes in place, and integrating blockchain technology into these systems can be challenging.
2	"Smart Contracts based on Private and Public Blockchains for the Purpose of Insurance Services"[2]	The authors suggest that private blockchains are more suitable for the insurance industry due to their lower cost, faster processing times, and increased security.	The paper discuss the limitations of using public blockchains, such as the cost of using computing power and the limited selection of templates for smart contracts on some platforms.
3	"A Blockchain-Based Decentralized Insurance Platform,"[3]	This paper proposes the use of a blockchain-based, decentralized platform for the insurance industry as a solution to the inefficiencies in centralized insurance systems. The platform aims to eliminate the need for intermediaries in process.	Decentralized insurance platforms may be more complex for users to understand and navigate compared to traditional insurance platforms.

Table 1.0 Literature Survey

Sl.No	Paper	Methodology	Limitation
4	"Review of Existing Blockchain-Based Insurance Solutions,"[4]	The authors of this paper review several existing insurance solutions that use blockchain technology, including Medishares, Etherisc, PAL Network, Teambrella, VouchForMe, D3i, Insurwave, Dynamis, and Consortium W3c.	Decentralized insurance platforms may struggle to integrate with traditional insurance systems, such as claims processing and underwriting, which can create barriers to adoption.
5	"ClaimChain: Secure Blockchain Platform for Handling Insurance Claims Processing,"[5]	ClaimChain features include the implementation of a blockchain infrastructure for automation of claims processing and the use of attack tree formalism to model infrastructure-level threats to data integrity.	The platforms may struggle to scale as the number of users increases, as they rely on a distributed network of computers to process transactions.
6	"Data Exchange Platform to Fight Insurance Fraud on Blockchain," [6]	The article discusses how blockchain technology can be used to improve the insurance industry, specifically in the areas of claims processing and settlement.	The platforms are not currently regulated in the same way as traditional insurance companies, which can lead to uncertainty and risk for policyholders.

Table 1.0 Literature Survey (Contd..)

Sl.No	Paper	Methodology	Limitation
7	"PRIDE: A Private and Decentralized Usage-Based Insurance Using Blockchain,"[7]	PRIDE uses a blockchain to record encrypted driving data and smart contracts to calculate premiums, and aims to improve the efficiency and security of insurance claims.	One of the main limitations of blockchain technology is its scalability. As the number of transactions and users on the network increase, it becomes more difficult for the system to process and validate these transactions in a timely manner.
8	"A Preliminary Study of the Impact of Blockchain Technology on the Application Level of Insurance Industry,"[8]	The authors conducted in-depth interviews with experts in the insurance industry to gather their insights on the current state and future potential of using blockchain in the industry.	There are regulatory and security challenges that need to be addressed before blockchain can be widely adopted in the industry.
9	"Design of Blockchain Application Framework for Claims Platform of Flight Delay Insurance," [9]	The overall architecture, technical architecture and data architecture of the flight delay insurance claim settlement platform based on blockchain are proposed.	Personal and sensitive insurance data must be kept private, and it can be difficult to ensure the privacy of this data on a public blockchain.

Table 1.0 Literature Survey (Contd..)

Limitations

- Centralized insurance management solutions lack trust and transparency due to reliance on a central authority.
- Implementation and maintenance costs of these systems burden smaller insurers.
- Data privacy and security risks arise from storing & processing sensitive information.
- Interoperability challenges result in inefficiencies and delays between different systems.

Problem Statement

- To develop a decentralized insurance management using blockchain for trust, transparency, and data authenticity.
- Enhancing efficiency and reducing financial burdens for insurers..
- Revolutionizing the industry with increased security and reliability.
- Promoting a more secure and reliable future for insurance.

Proposed Model

- Use Ethereum and Solidity to build a secure, decentralized ledger for insurance transactions.
- Store policy details, premiums, and policy holder information on the ledger for transparency.
- Utilize Ethereum's security features for platform integrity and protection against unauthorized access.

Users Profiles in the App

1. Admin Official

- Manages products : can add and edit product details.
- Manages the approval process for claims.

2. Buyer/Customer

- Can purchase products and insurance.
- Can raise and check claim status.

Users Profiles in the App

3. Police Official

- Verify claims by reviewing supporting documents.
- Evaluate claim details.

Access control is achieved using secure MetaMask wallets, which can be either hardware keys or digital private keys.

Architecture

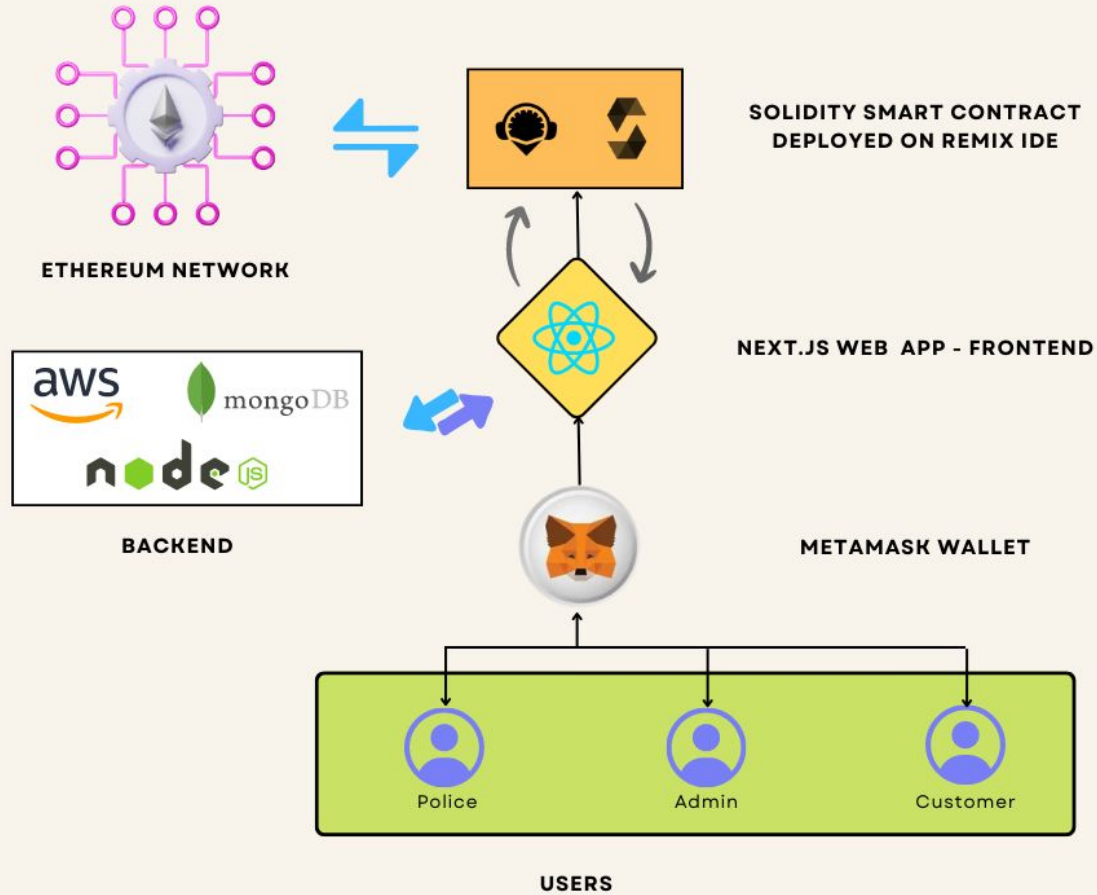


Fig 1.0 System Architecture

System Modules



Fig 2.0 System Modules

Implementation ~ Frontend

- Next JS and Next UI are used for UI design in the frontend module.
- Tailwind CSS is integrated into the frontend for styling.
- Metamask browser extension is used for authentication and login.
- Frontend is deployed and accessible at chainsafe.vercel.app.

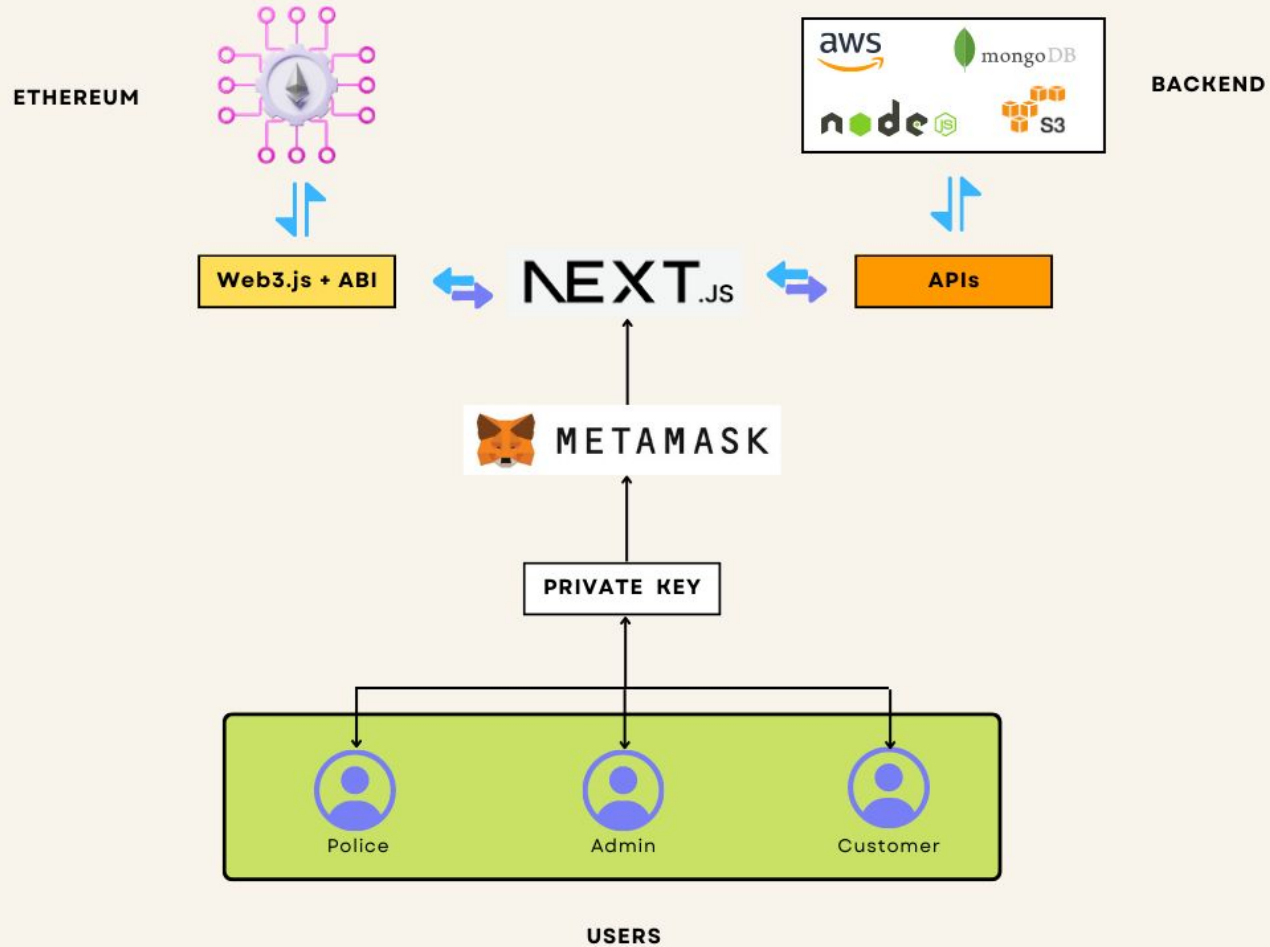


Fig 3.0 Frontend Architecture

Implementation ~ Smart Contracts

- Smart Contract module implemented with Solidity stores claim details.
- The contract is deployed on Ethereum blockchain using Remix IDE.
- The smart contract is connected to Next.js frontend via Web3.js library.
- Connection is established using ABIs for interacting with deployed Smart Contract.

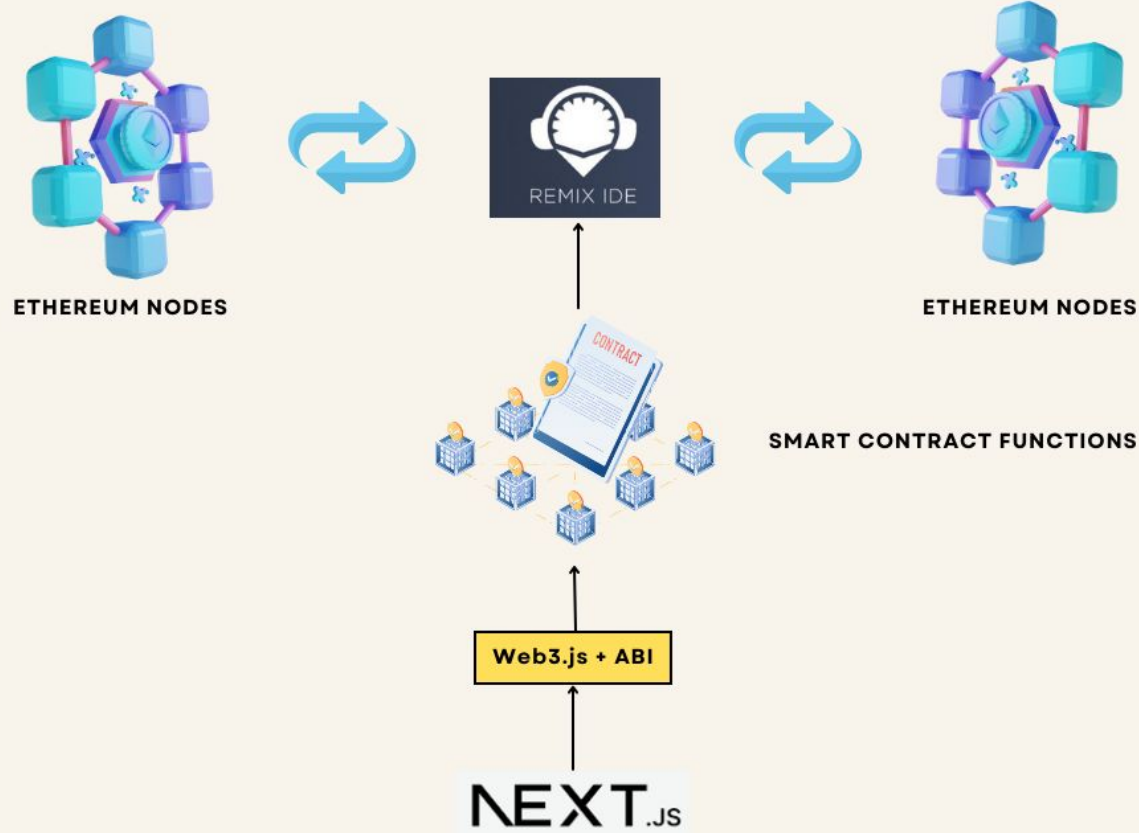


Fig 4.0 Blockchain Architecture

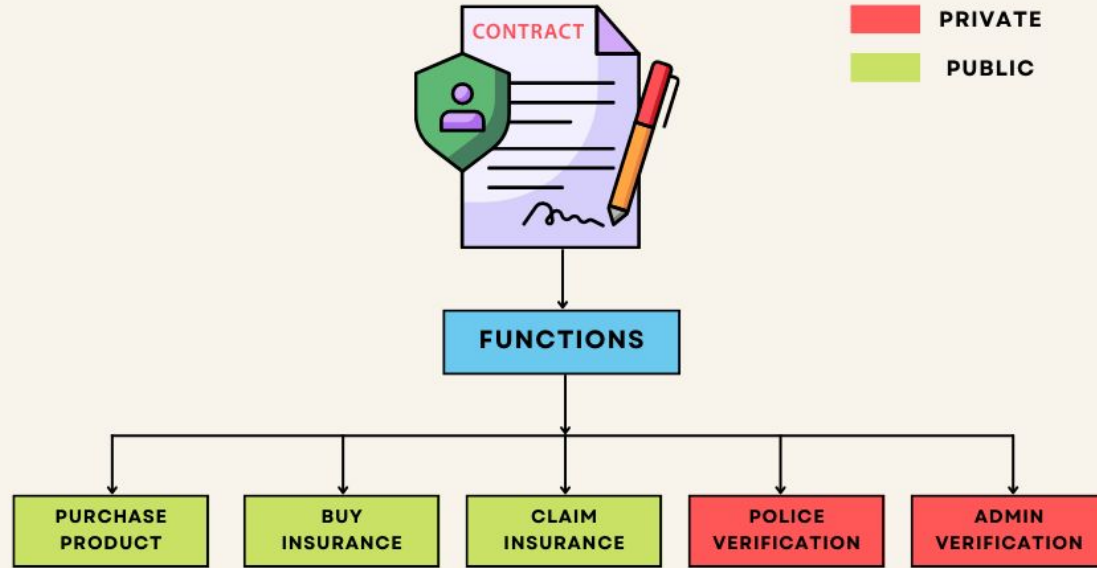


Fig 5.0 Smart Contract Functions

Implementation ~ Backend

- The backend is developed with Node.js Express, hosted on an AWS EC2.
- Node server handles CRUD operations on the database [MongoDB]
- API endpoints are provided for interacting with the database.
- The implementation follows RESTful principles, ensuring a standardized and scalable architecture

mongoDB Atlas



node
+
express



API
Endpoints



NEXT.js



AWS S3 SDK



Fig 6.0 Backend Architecture

Implementation ~ Database & File Storage

- MongoDB Atlas: Cloud-hosted database for product details and username mapping, integrated with Node.js Express app on AWS EC2.
- AWS S3: Secure and scalable object storage for support documents.
- Integration: Seamless connection between database and file storage modules for efficient data management in the insurance app.

Results ~ User View

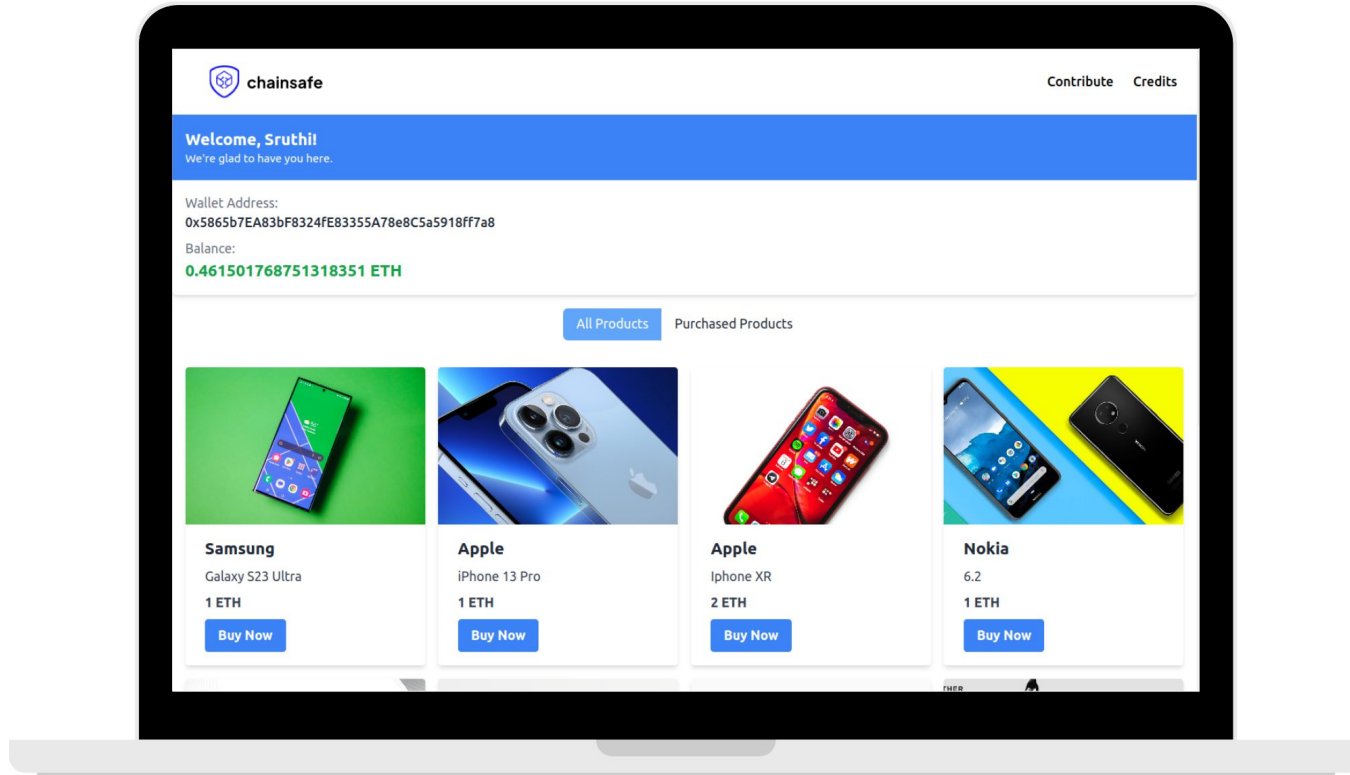


Fig 7.0 List of products in user login

Results ~ User View

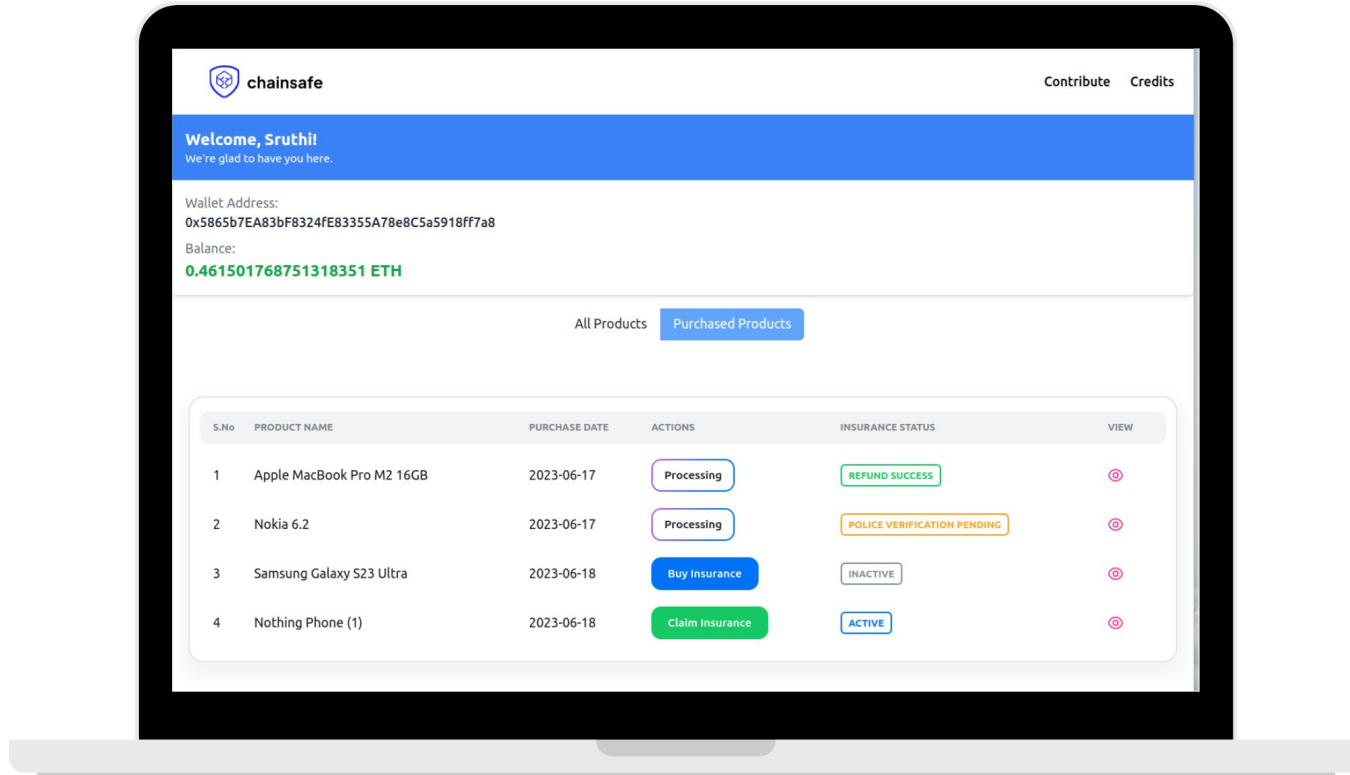


Fig 8.0 List of purchased products & claims in user login

Results ~ Police View

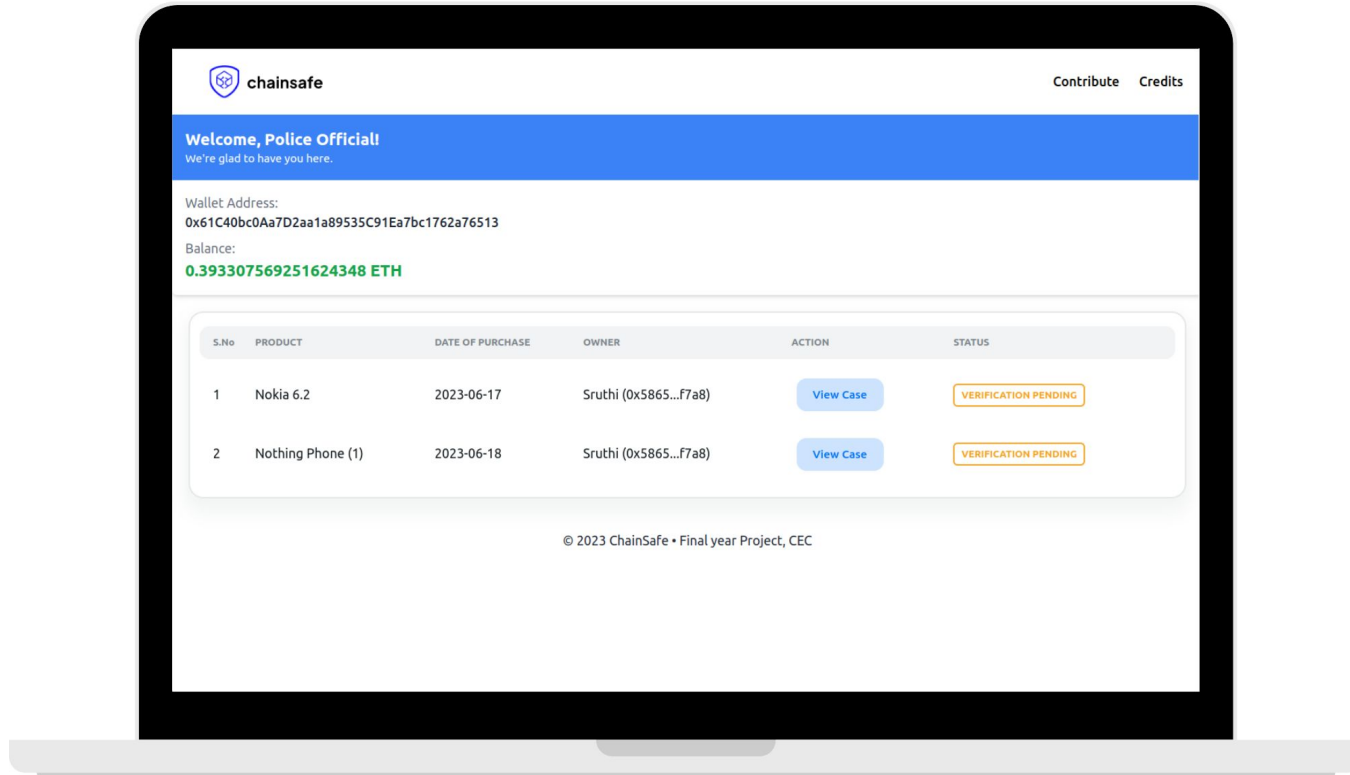


Fig 9.0 List of pending insurance claims in police login

Results ~ Police View

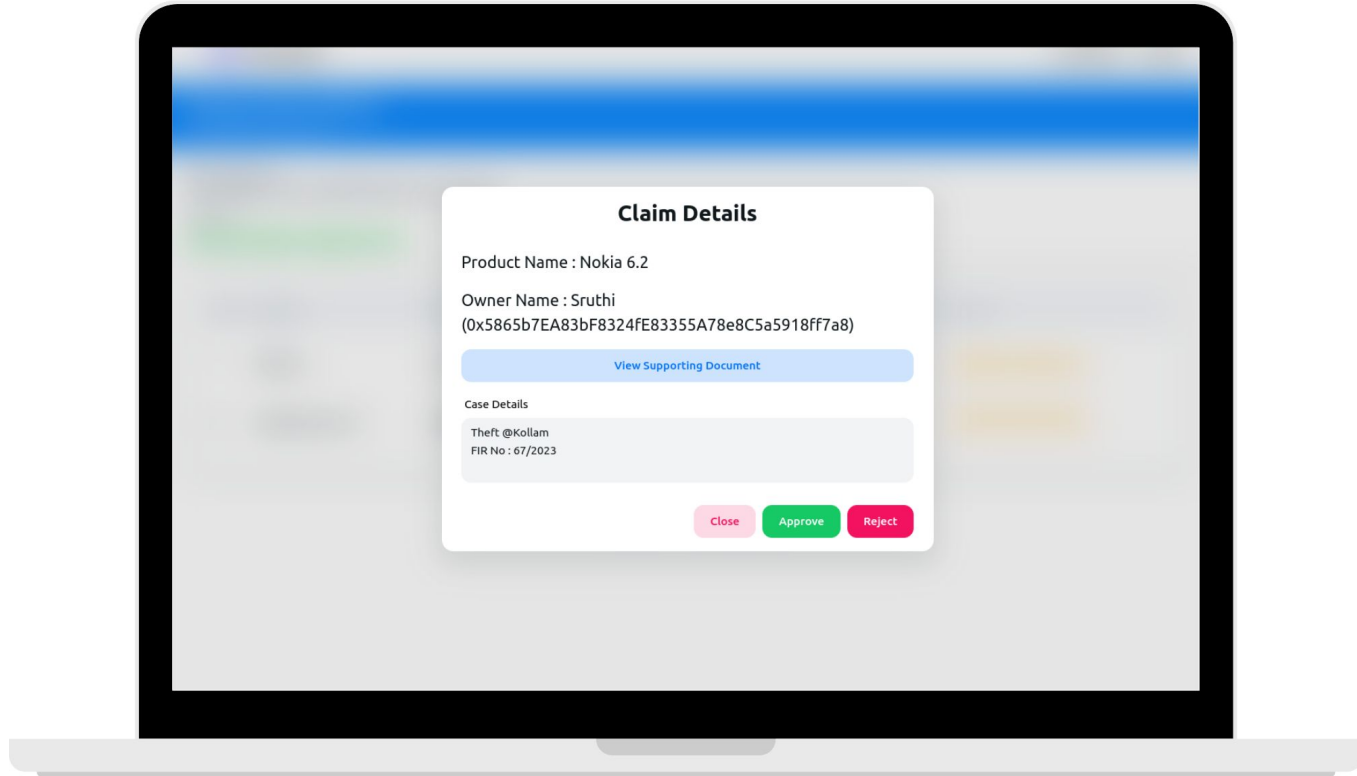


Fig 10.0 Option to review claim by Police Official

Results ~ Admin View

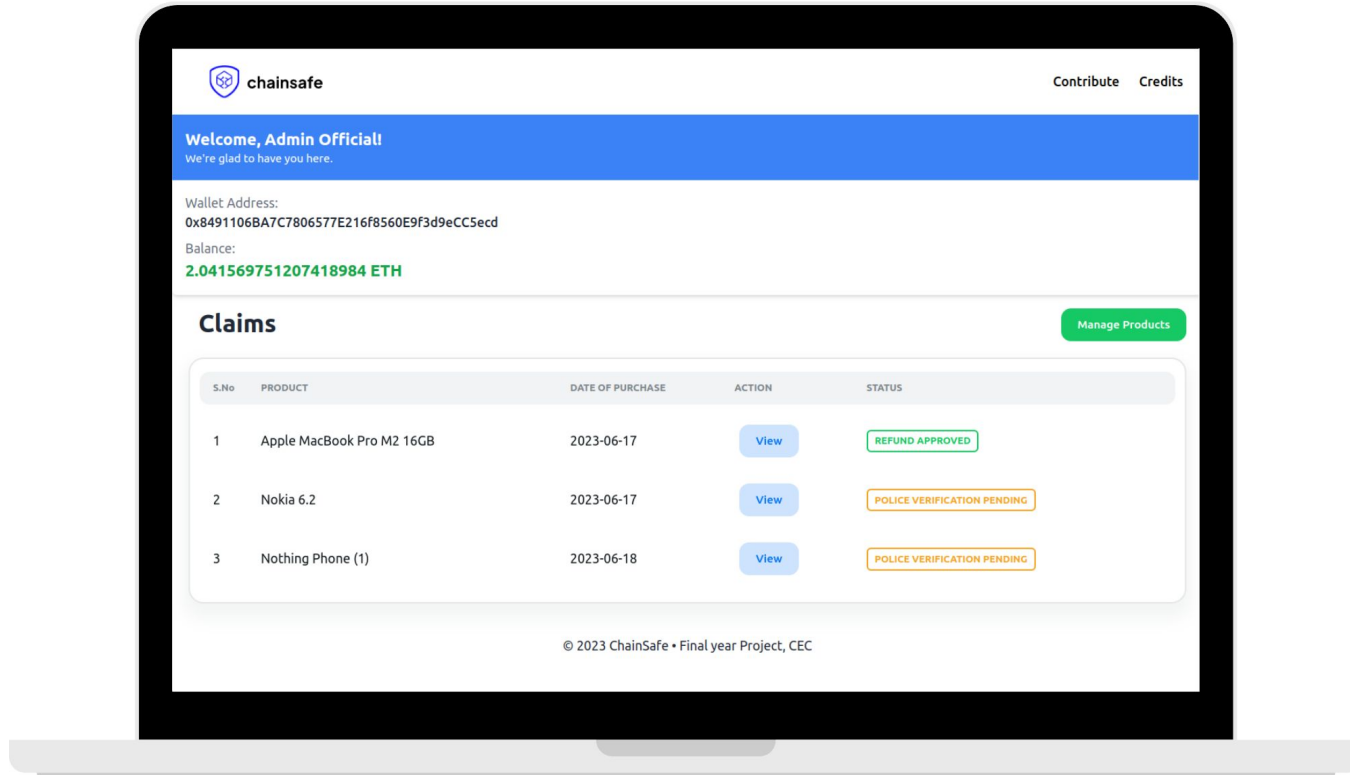


Fig 11.0 List of all claims by users in admin login

Results ~ Admin View

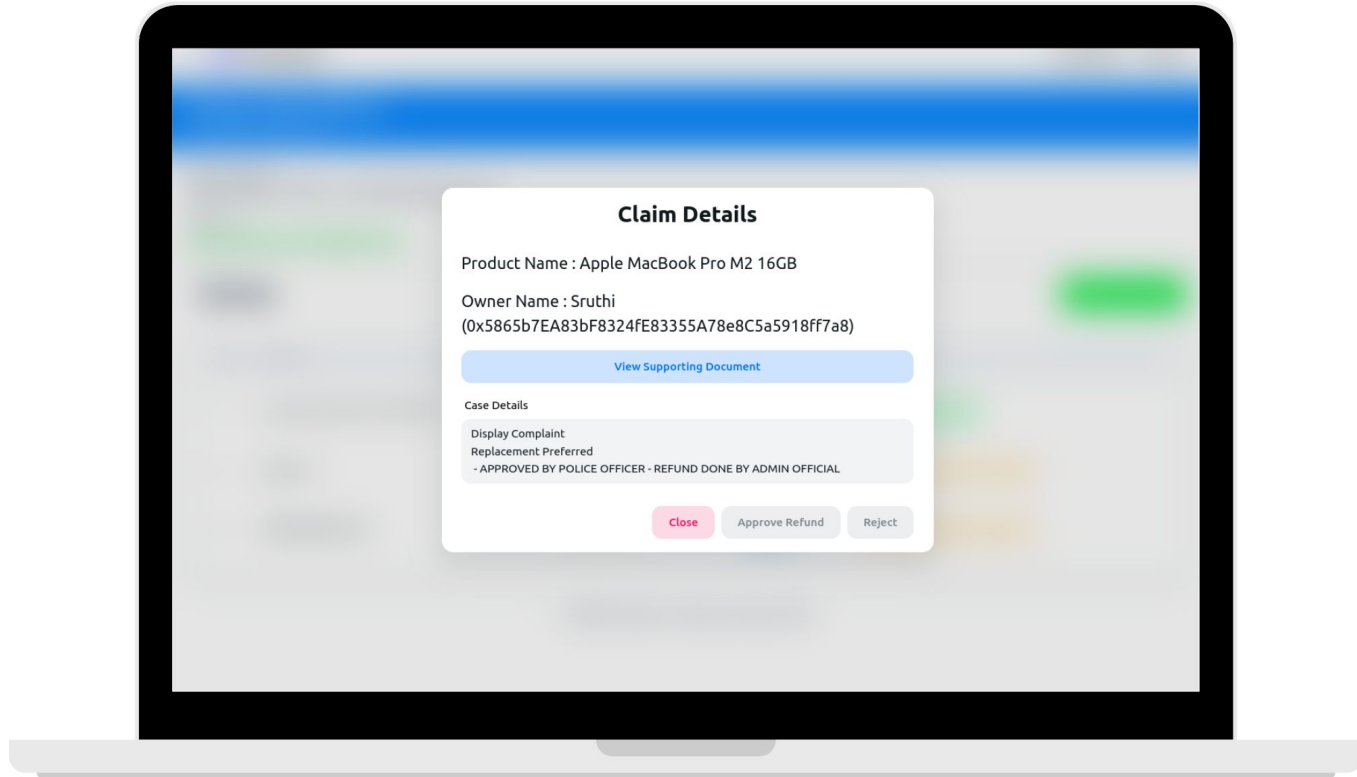
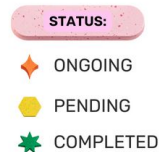


Fig 12.0 Option to verify, view status on ongoing claims

Gantt Chart











Tasks	FEBRUARY	MARCH	APRIL	MAY
Planning				
Research				
UI Design (Frontend)				
Frontend Development				
Metamask Integration				
Smart Contracts & Backend				
Testing & Deployment				
Documentation				

Table 2.0 Gantt Chart

Conclusion

- Blockchain insurance systems boost efficiency, security, and trust by eliminating intermediaries and automating processes.
- Blockchain's immutability strengthens data integrity, compliance, and accountability in insurance.
- Adoption of blockchain streamlines claims, enhances customer satisfaction, and detects fraud in real-time.

Future Scope

- Blockchain-based insurance systems offer scalability, regulatory compliance, and integration with legacy systems.
- Collaboration among insurers, technology providers, and regulators is crucial for driving innovation in blockchain insurance.
- Embracing blockchain can lead to a more efficient, secure, and customer-centric insurance ecosystem.

References

- [1] **V. Aleksieva, H. Valchanov, and A. Huliyan,** "Implementation of Smart Contracts based on Hyperledger Fabric Blockchain for the Purpose of Insurance Services," *in 2020 International Conference on Biomedical Innovations and Applications (BIA)*.
- [2] **V. Aleksieva, H. Valchanov, and A. Huliyan,** "Smart Contracts based on Private and Public Blockchains for the Purpose of Insurance Services," *in 2020 International Conference Automatics and Informatics (ICAI)*.
- [3] **S. Alwis and T. M. K. K. Jinasena** "A Blockchain-Based Decentralized Insurance Platform," *in International Research Conference on Smart Computing and Systems Engineering (SCSE), 2022*.
- [4] **A. Averin, E. Musaev, and P. Rukhlov** "Review of Existing Blockchain-Based Insurance Solutions," *in 2021 International Conference on Quality Management, Transport and Information Security*
- [5] **N. R. Bhamidipati** "ClaimChain: Secure Blockchain Platform for Handling Insurance Claims Processing," *in 2021 IEEE International Conference on Blockchain (Blockchain)*.

References

- [6] **I. Nath** "Data Exchange Platform to Fight Insurance Fraud on Blockchain," in *2016 IEEE 16th International Conference on Data Mining Workshops (ICDMW)*.
- [7] **Z. Wan, Z. Guan, and X. Cheng**, "PRIDE: A Private and Decentralized Usage-Based Insurance Using Blockchain," in *2018 IEEE International Conference on Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom)*.
- [8] **T. -W. Yu, A. -P. Wang, L. -M. Tseng, and W. -M. Tsao** "A Preliminary Study of the Impact of Blockchain Technology on the Application Level of Insurance Industry," in *2021 IEEE International Conference on Social Sciences and Intelligent Management (SSIM)*.
- [9] **V. Aleksieva, H. Valchanov, and A. Huliyan** "Design of Blockchain Application Framework for Claims Platform of Flight Delay Insurance," in *2022 Global Conference on Robotics, Artificial Intelligence and Information Technology*.
- [10] **P. Hacker (ed.), I. Lianos (ed.), G. Dimitropoulos (ed.), S. Eich (ed.)** "*Regulating Blockchain: Techno-Social and Legal Challenge*," *Oxford Academics*.

References

- [11] **Solidity Documentation** [Online] : <https://docs.soliditylang.org>.
- [12] **NextJS Documentation** [Online] : <https://nextjs.org/docs>.
- [13] **NextUI Documentation** [Online] : <https://nextui.org/docs/>.
- [14] **Metamask Developer Documentation** [Online] : <https://docs.metamask.io/>.
- [15] **MongoDB Documentation** [Online] : <https://www.mongodb.com/docs>.
- [16] **Node.js Documentation** [Online] : <https://nodejs.org/en/docs>.
- [17] **OpenAI - ChatGPT** [Online] : <https://chat.openai.com/>.
- [18] **AWS Documentation** [Online] : <https://docs.aws.amazon.com/ec2/index.html>

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