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Enhancing Orphanage Rice Donation Management through IoT ND Blockchain Technologies

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ABSTRACT: Recent years have witnessed the emergence of the Internet of Things (IoT) systems that incorporate blockchain (BC) elements in their architecture. Due to discrepancies between the requirements of IoT systems and the characteristics of BC networks, the motivations and design of these blockchain-enabled IoT systems (BC-IoT) are not only intriguing from a research perspective but also invaluable in practice. To improve resource management for vulnerable persons, our ultimate objective is to set up a system that is transparent, safe, and traceable so that donated rice may be regularly transferred from donors to orphanages. Installing smart sensors to track the whole supply chain of donated rice is being considered as part of the system's Internet of Things component. In real-time, these sensors track the whereabouts, condition, and transit of rice shipments. After then, all parties involved in the donation process will be able to access the data via a single website. Contribution management processes that include Block chain technology should be more open, secure, and accountable. Distributed and decentralized ledger technology known as Block chain records every single rice transaction in an unchangeable database. Transparency and audit ability in all transactions helps build confidence with stakeholders and funders while also protecting against fraud and unwanted access.

KEYWORDS: Block chain technology, donated rice, supply chain, stakeholders and funders.

I. INTRODUCTION

The BC technologies allow mutually distrusting parties, such as IoT-enabled things, to cooperate and exchange value in a verifiable manner without relying on intermediaries. The concept of the Internet of Things has sparked the broad adoption of several interconnected gadgets and software programs. The IoT, or Internet of Things, is an ever-increasingly complicated network. Block chain technology, with its distributed ledger and other security-enhancing characteristics, may have a major effect on this system. While they approach the realization of ideas and the creation of creative, secure software in different ways, both remain formidable rivals. These days, smart gadgets seem to be everywhere. The concept of the Internet of Things has sparked the broad adoption of several interconnected gadgets and software programs. The IoT, or Internet of Things, is an ever-increasingly complicated network. Block chain technology, with its distributed ledger and other security-enhancing characteristics, may have a major effect on this system. The Internet of Things (IoT) has recently been the focus of assaults due to several well-publicized security vulnerabilities. Agriculture, transportation, supply chain management, health, and insurance are just a few of the many sectors hit hard by these vulnerabilities. Sensitive data is vulnerable to illegal actions because to the increasing and autonomous nature of M2M connections. Take, for instance, the potentially disastrous impact on privacy that may result from unwanted sniffing nodes gaining access to personal data sent by wearables. It is of the utmost importance to guarantee the security and confidentiality of this vital infrastructure as the Internet of Things (IoT) keeps growing in scale. Businesses are racing to embrace digital transformation and the smart world as a result of the impact of block chain, a distributed ledger system that relies on consensus among nodes, on Internet of Things (IoT) applications. Major corporations like IBM have jumped on the Block chain bandwagon, and researchers are toiling away at the many potential applications in the IoT.

II. LITERATURE REVIEW

David I. Wilson (2023) the food industry has seen tremendous transformation in the previous several decades as a result of globalization, technology advancements, and shifting consumer expectations. When it comes to improving food production, marketing, and safety, big data and AI are now in the lead. The ever-expanding capabilities of artificial intelligence and big data analytics are opening up new opportunities for development and change in the food market. More and more businesses are using AI and big data to refine product quality, meet consumer demands, and propel the food sector towards a brighter, more sustainable future. Quality, safety, risk management, and consumer insights are some of the areas that this article delves into as it examines the ways in which AI and big data have impacted food manufacturing.

Manreet Singh Bhullar (2022) An explosion of "big data," or the enormous volumes of streaming data produced by the Internet of Things (IoT), has opened up new possibilities for tracking food and agricultural output. Big data from social media platforms and sensors is becoming more valuable to the food business. When we look at the impact of AI, big data, and the Internet of Things on agri-food systems, we see how intertwined these technologies are. Big data, AI, and the IoT are revolutionizing many aspects of the food industry. For example, spectral methods and sensor fusion are revolutionizing food quality assessment; gene sequencing and blockchain-based digital traceability are revolutionizing food safety; and social media platforms are revolutionizing open innovation and sentiment analysis. Particular focus is given to the results of translational research and the business-friendly implementations.

André Van Rooyen (2022) Food insecurity is rampant in Sub-Saharan Africa (SSA), and this research seeks to understand the root causes of this problem by analyzing the region's irrigation systems and agricultural output. The third instalment of this series examines the history of the area. While the famines in Darfur and the Sahel were underway in 1974, the term "food security" was first used. Although sub-Saharan Africa is a net exporter of agricultural commodities, there has been less success in easing food insecurity in the region. One important component of this problem is the persistence of export-oriented agricultural production methods that emerged during colonization. In order to satisfy the needs of North American consumer and industrial markets, these systems depleted precious resources such as water, land, and labour. In times of food scarcity, traditional social contracts have been a lifeline for communities and their leaders.

Marco Bortolini (2017) This article will explain what the IoT is and how it works. After that, we will go over the steps necessary to build an Internet of Things (IoT) infrastructure that will facilitate the administration, control, and planning of FSC operations. Detailed diagrams of entities, physical products, physical and informational flows, phases, and associated activities are presented to illustrate the observed supply chain's interaction with the external environment. To top it all off, we showcase an FSC management simulation game that uses the Internet of Things concept. By combining real-world food ecosystems with virtual computer-aided control settings, this tool will demonstrate the benefits and potential of this integration.

Guido Bini (2016) this research looks at the food security situation in West Africa during the last quarter of a century. Reducing world hunger in half by 2015 is the principal goal of the Millennium Development Goals. Eight West African governments have pledged to eradicate hunger by the end of the year, so there is optimism even if Sub-Saharan Africa has not yet achieved. This research explores the issue of global food commerce and looks at how West Africa's food security has been impacted by the recent rise in food imports. The last half of the article focuses on Benin, a nation that has significantly reduced undernourishment since 1990. This study aims to discover how food security policies impact rural development by looking at the importance of short food supply chains. This research uses the Atacama department in northern Benin as an example of a location that is often linked with agricultural exports to demonstrate the growth of local food networks.

Van der Hoeven Marinka (2016) started Millions of people in South Africa still go hungry every day, despite the country's status as "food secure" and its many agricultural advantages. Poverty is a major component, and it is more common in rural regions. Even if government agricultural development initiatives have usually failed, traditional and indigenous food crops may nevertheless make a big difference. Commercially farmed crops, such as wheat and maize, have lately been the focus of these initiatives. The paper's authors conducted a multi-criteria analysis to find out if traditional and indigenous crops might significantly improve food security in South Africa. Many criteria were developed to rank the different traditional and indigenous food crop choices, with the article's preferred notion of food security serving as the foundation.

IoT Definition

Established standards govern the operation of the vast, globally distributed system of linked computer systems, networks, and devices that make up the Internet. Then, links to remote servers and analytics services in the cloud may be set up, and data can be transferred. The English word "thing" has a wide range of possible meanings. In situations when precision is not paramount, the word "thing" may denote anything from a tangible object to a broader concept, situation, or activity. Always carry an umbrella just in case the weather becomes bad. One more name for a streetlight is an item. That he accomplished anything out of the ordinary is an action reference. The administration's perspective might be shown with the plethora of situational allusions.

IoT and IoT Applications

The "smart things" that comprise the Internet of objects (IoT) have the potential to collaborate and share data in order to enhance business operations, alleviate human suffering, and boost the economy as a whole. Smart cities, healthcare, transportation, energy management, retail, logistics, insurance, and supply chains are just a few of the numerous sectors that are rapidly adopting the Internet of Things (IoT). Through machine-to-machine (M2M) communication, which entails linking a diverse array of devices to the internet, the execution of typical tasks inside an IoT system becomes feasible. Last but not least, an IoT system will include a user interface, often called a back-end system. The building blocks of an Internet of Things system that gather information include sensors, microcontrollers, and antennas.

Potential IoT Use Cases for Ensuring Online Data Security

Because of the proliferation of Internet of Things devices, our concept of connectivity has changed. With the advent of the Internet of Things, it is now feasible to link items that were previously not linked to the web. Many goods may now have internet connectivity and useful functions thanks to the Internet of Things (IoT). There has been a meteoric rise in the number of internet-enabled home appliances in the last few years. Here you may find a wide variety of items, including cars, refrigerators, air conditioners, and even hairbrushes. Concerns about the security and privacy of the Internet of Things (IoT) have emerged at the same time as the IoT's true potential is being recognized. The following is a comprehensive overview of the many security and privacy issues surrounding the Internet of Things (IoT).

The Interdependence of All Things

Concerns about the privacy and security of the Internet of Things (IoT) may be eased by having a good understanding of what it is. A simple definition of the "Internet of Things" (IoT) would be a global network of linked computer devices that can share data over the web. To ensure proper operation, the devices share information, generate data, and collect data. Many individuals are concerned that their internet-connected devices are monitoring their every action and collecting personal information. It is worth noting that the Internet of Things market will be worth more than $500 billion by 2022. Concerns about data privacy and security will only grow as the number of connected devices continues to grow.

III. RESEARCH METHODOLOGY

Utilising PBFT in conjunction with shading or layer-2 solutions can significantly enhance network scalability. Despite being efficient and scalable, PBFT may have different trade-offs when compared to other consensus algorithms. This isn't always the case in decentralised settings as it assumes a constant and well-known set of validates. Improving blockchain scalability via the application of Practical Byzantine Fault Tolerance (PBFT) is a continual work. A number of people are wondering if the PBFT algorithm can achieve higher throughput than alternative consensus techniques, such as Proof of Work. Just follow these methods to make your blockchain even more scalable. All links in the supply chain depend on the interdependence of the three flows: monetary, physical, and data. Problems with the flow of information in the food supply chain manifest as inadequate traceability, food fraud, and a lack of openness. There is hope that this field may finally discover a trustworthy platform that can enhance and simplify data movement all the way through the supply chain, thanks to the extensive usage of blockchain technology. Additional benefits of a self-assured supply chain include better management of partners and lower supply chain risks. Second, blockchains are impervious to data-related fraud schemes like social engineering, hacking, and extortion since no one can change the data without everyone else's permission. When fully operational, the blockchain network will ensure that all parties participating in the supply chain have easy access to all product data.

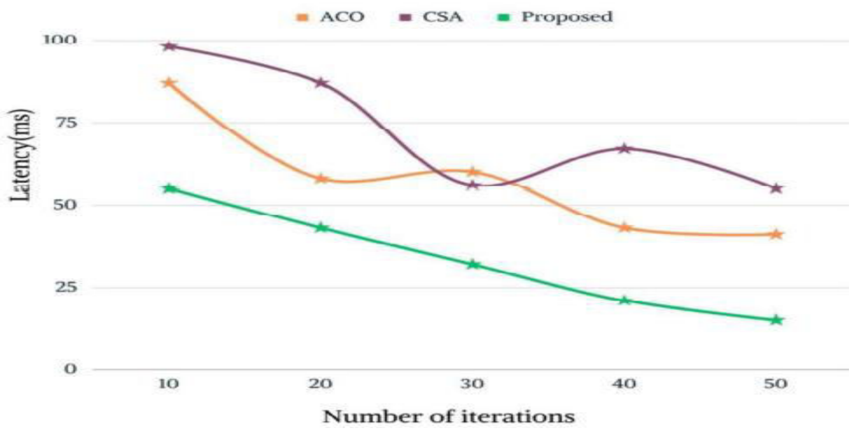
IV. RESULTS AND DISCUSSIONS

The search terms "blockchain" and "supply chain" were combined to get the appropriate database entries. Only news articles and wire reports published between 2016 and 2018 were taken into consideration, because to the high volume of pioneering Blockchain Technology (BCT) advances during that period. After significant deliberation, a massive dataset of 118 news items covering 126 industry initiatives by companies worldwide was approved. Prototypes, white papers, proof-of-concepts, pilot tests, beta tests, and all the other investments and efforts that have allowed BCT supply chain solutions will be considered industry "sample-cases" going forward. Our research into various forms of ICT was critical to the development of a system capable of detecting BCT-supported supply chain capabilities. We classify and name comparable supply chain capabilities according to the criteria and items used to assess them in the published research.

Table 1: Parameters used for experimental setup

Parameters	Ranges
Average transaction size	100 bites
Maximum every shard block size	8.2 MB
Maximum block interval	1.5 s
Header size of the block	80 bytes
Population size of BHO algorithm	10
Number of epochs based on BHO	50
Number shard maximum allowable	8

A few of blockchain's many uses include anonymous transactions, safe data storage in automotive networks, and identity verification. Prior studies have shown a functional and effective model for the targets; nevertheless, there are a number of downsides, including insufficient privacy protection and no way to improve detection accuracy.



Graph 1: Performance analysis based on Latency

Applying Shard technology to PBFT By using blockchain technology, we achieved our objective of enhancing throughput while reducing latency. An approach to improving speed, responsiveness, and scalability is known as Black Hole Optimisation (BHO). An Intel core CPU, 16 GB of RAM, and a Windows 10 PC are used to run the simulations in MATLAB.

Table 2: Simulation specifications

No.	Type	MIPS	RAM	Bandwidth	Virtual Machine Monitor	Virtual Machine Capacity	Processing Elements
1	A	300	512-2 GMB	10 – 100 Mb/s	Xen-IntT	2000-2200 MB	1-3
2	B	500	256-512 GMB	10 – 100 Mb/s	Xen-IntT	2000-2200 MB	1-3
3	A	300	512-2 GMB	10 – 100 Mb/s	Xen-IntT	2000-2200 MB	1-3
4	B	500	256-512 GMB	10 – 100 Mb/s	Xen-IntT	2000-2200 MB	1-3
5	A	300	512-2 GMB	10 – 100 Mb/s	Xen-IntT	2000-2200 MB	1-3
6	B	500	256-512 GMB	10 – 100 Mb/s	Xen-IntT	2000-2200 MB	1-3

Various server configurations for core, aggregation, and accessibility are all considered in this design. The model's execution setups require a seven-core CPU. For virtual number requests (VNRs), our group performs a basic evaluation. Initiating the topology with a VNR of 0.0001 will kick off the simulation.

V. CONCLUSION

Based on our findings, a decentralized system design might pave the way for an open and secure rice supply chain. By using smart contracts and the Ethereal block chain, this system eliminates middlemen and instantly tracks and monitors monetary transactions. A building design and development algorithm was developed and used to showcase the transparency of the rice supply chain. Along with a customer-pleasing, user-friendly concept, the model ensures that all parties involved in the supply chain are aware of the current product quality and may make choices that are beneficial to everybody. As a result of reduced transaction and execution costs, our testing reveal that the PoA architecture decreases fuel consumption overall. Among the many major supply chain concerns that will be resolved in subsequent volumes are electronic payment processing and delivery confirmation. At the very beginning of the supply chain is the first stage in production, which entails transforming raw materials into a finished product. This process involves several middlemen. Typically, we have faith in both the product and the business that makes it. Entering the Fourth Industrial Revolution, blockchain technology may destroy confidence while revealing no truth. Blockchain technology has opened the door to a safer and more convenient way to store data. The primary goal of using blockchain technology is to guarantee security.

REFERENCES

1. David I. Wilson (2023),"The Application of Artificial Intelligence and Big Data in the Food Industry",Foods,ISSNno:2304-8158,Vol.12(24),Pages. 4511.https://doi.org/10.3390/foods12244511
2. Manreet Singh Bhullar (2022),"IoT, Big Data, and Artificial Intelligence in Agriculture and Food Industry,"in IEEE Internet of Things Journal,ISSNno: 2327-4662,Vol.9,No.9,Pages.6305-6324.doi: 10.1109/JIOT.2020.2998584.
3. André van Rooyen (2022),"Why food insecurity persists in sub-Saharan Africa: A review of existing evidence",Food Security,ISSNno:1876-4525, Vol.14,Pages.845-864.https://doi.org/10.1007/s12571-022-01256-1
4. Marco Bortolini (2017),"Internet-of-things Paradigm in Food Supply Chains Control and Management",Procedia Manufacturing,ISSNno:2351-9789,Vol. 11,Pages.889-895.DOI:10.1016/j.promfg.2017.07.192
5. Marinka van der Hoeven (2016),"Promoting Food Security through Indigenous and Traditional Food Crops",Agroecology and Sustainable Food Systems,ISSNno:2168-3573,Vol.40(8),DOI:10.1080/21683565.2016.1159642
6. Jo Banks (2003),"Understanding Alternative Food Networks: Exploring the Role of Short Food Supply Chains in Rural Development",Environment and Planning A,ISSNno:1472-3409,Vol.35(3),Pages.393-411.DOI:10.1068/a3510
7. Berit Nygård (2002),"De-globalization of Food Markets? Consumer Perceptions of Safe Food: The Case of Norway",SociologiaRuralis,ISSNno: 1467-9523,Vol.38(1),Pages.35-53.DOI:10.1111/1467-9523.00062
8. Gerardo Torres Salcido (2008),"Localized Agrifood Systems: State of research and perspectives",Cahiers Agricultures,ISSNno:1777-5949,Vol.17(6),Pages. 513-519.DOI:10.1684/agr.2008.0251
9. Raj Patel (2009),"Food Sovereignty",The Journal of Peasant Studies,ISSNno: 1743-9361,Vol.36(3),Pages.663-706.https://doi.org/10.1080/03066150903143 079
10. Daniel Cruz (2023),"The ethics of food sovereignty: discourses for transformative social change and community development practices by peasant movements",Community Development Journal,ISSNno:0010-3802, Vol.58,Issue.1,Pages.64-78.https://doi.org/10.1093/cdj/bsac034

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