Report On

Supply Chain Management Using Blockchain

Submitted in partial fulfillment of the requirements of the Course project in Semester VII of the fourth year of Computer Science and Engineering [Data Science]

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CERTIFICATE

This is to certify that the Mini Project entitled "**Supply Chain Management Using Blockchain**" is a bonafide work of **Samrudhi Mhatre (Roll No.71), Vishal Phatkare (Roll No. 47), Akash Adarkar (Roll No.68)**, submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of "**Bachelor of Engineering**" in Semester VII of Fourth Year "**Computer Science and Engineering (Data Science)**" .

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Chapter 1
Introduction

1.1 Introduction

Supply chain management is the backbone of modern commerce, encompassing the intricate web of processes and transactions that bring products from manufacturers to consumers. It involves a multitude of stakeholders, from suppliers and manufacturers to logistics providers and retailers, all of whom need to collaborate effectively for the seamless flow of goods. However, traditional supply chain systems often grapple with challenges such as lack of transparency, inefficiencies, data discrepancies, and security issues.

Blockchain technology, originally conceived as the underlying architecture for cryptocurrencies like Bitcoin, has rapidly evolved beyond its financial applications. It has emerged as a transformative force with the potential to revolutionize supply chain management. Blockchain offers a distributed, decentralized, and immutable ledger that can securely record, verify, and track every transaction and data point within a supply chain network.

1.2 Problem Statement

The existing supply chain management systems face significant challenges, including limited transparency, inefficiencies, and security vulnerabilities. These issues result in operational inefficiencies, delays, and increased risks such as counterfeiting and fraud. To address these problems, there is a need to explore how blockchain technology can be effectively implemented in supply chain management. This investigation aims to understand how blockchain can enhance transparency, security, and efficiency in supply chains, while also considering the specific challenges and solutions required for its successful adoption, particularly in small and medium-sized enterprises (SMEs).

1.3 Objectives

The objectives of this project are multifold. Firstly, it endeavors to develop a blockchain-based Supply Chain system that ensures the immutability and incorruptibility of supply chain records. Secondly, it aims to establish a framework that promotes transparency and reduces the risk of fraudulent supply chain transactions, thereby minimizing disputes and corruption. Thirdly, it seeks to streamline the supply chain registration and transaction procedures, making them more efficient and accessible to supply chain owners and authorities. Ultimately, the project aims to provide an end-to-end solution that revolutionizes supply chain management and ownership documentation.

Chapter 2
Literature Survey

2.1 Analysis of Literature

Sr. No.	Title of the Paper	Advantages	Disadvantages
1	Blockchain Technology for Supply Chain Management	Acknowledges blockchain's potential to improve supply chain traceability, authenticity, and cost-effectiveness.	Lacks specific research findings and overlooks potential implementation challenges
2	Supply Chain Management using Blockchain	Demonstrates the potential of IoT sensors and blockchain to enhance supply chain transparency, reduce errors, and increase trust.	Lacks specific evidence and overlooks potential implementation challenges and costs.
3	Applications of Blockchain to Improve Supply Chain Traceability	Acknowledges blockchain's potential for enhancing supply chain traceability and transparency across various SCM functions.	Lacks specific details about industry applications and empirical evidence, making it challenging to assess the actual impact and future directions.
4	Blockchain in Supply Chain Management	Highlights the potential of blockchain technology to enhance supply chain transparency and trust among stakeholders.	Lacks empirical evidence and fails to address potential implementation challenges and costs.
5	Blockchain technology in supply chain management: an organizational theoretic overview and research agenda.	Acknowledges blockchain's disruptive potential across various sectors and presents a systematic literature review approach.	Lacks specific findings and detailed limitations or future research directions, making it challenging to assess the study's depth and impact.

2.2 Research Gap

The existing system for Supply Chain Management using Blockchain has notable limitations. Blockchain's scalability challenges can hinder its ability to handle the high transaction volumes inherent in supply chains. Integrating blockchain into established systems can be complex and costly, while navigating varied regulatory requirements presents an additional hurdle. Data privacy concerns arise due to the immutability of blockchain, and user adoption can be hindered by a lack of understanding and expertise. Energy consumption and the lack of interoperability between different blockchain platforms further complicate adoption. Mitigating these limitations requires careful planning, adherence to regulations, and the consideration of specific supply chain needs to ensure successful integration.

Chapter 3

Proposed System

3.1 Introduction

The proposed system for Supply Chain Management using Blockchain offers a promising solution to address the limitations of the existing system. It leverages blockchain's transparency, security, and traceability features to create a decentralized and tamper-proof ledger that enhances supply chain operations. This system aims to automate processes through smart contracts, optimize collaboration among stakeholders, and ensure the authenticity and quality of products at every stage. It provides a real-time view of the supply chain, reducing fraud and errors, while also improving efficiency and data security. By integrating blockchain, the proposed system seeks to create a more resilient, transparent, and efficient supply chain ecosystem, benefiting businesses, consumers, and regulatory authorities alike.

3.2 Architecture

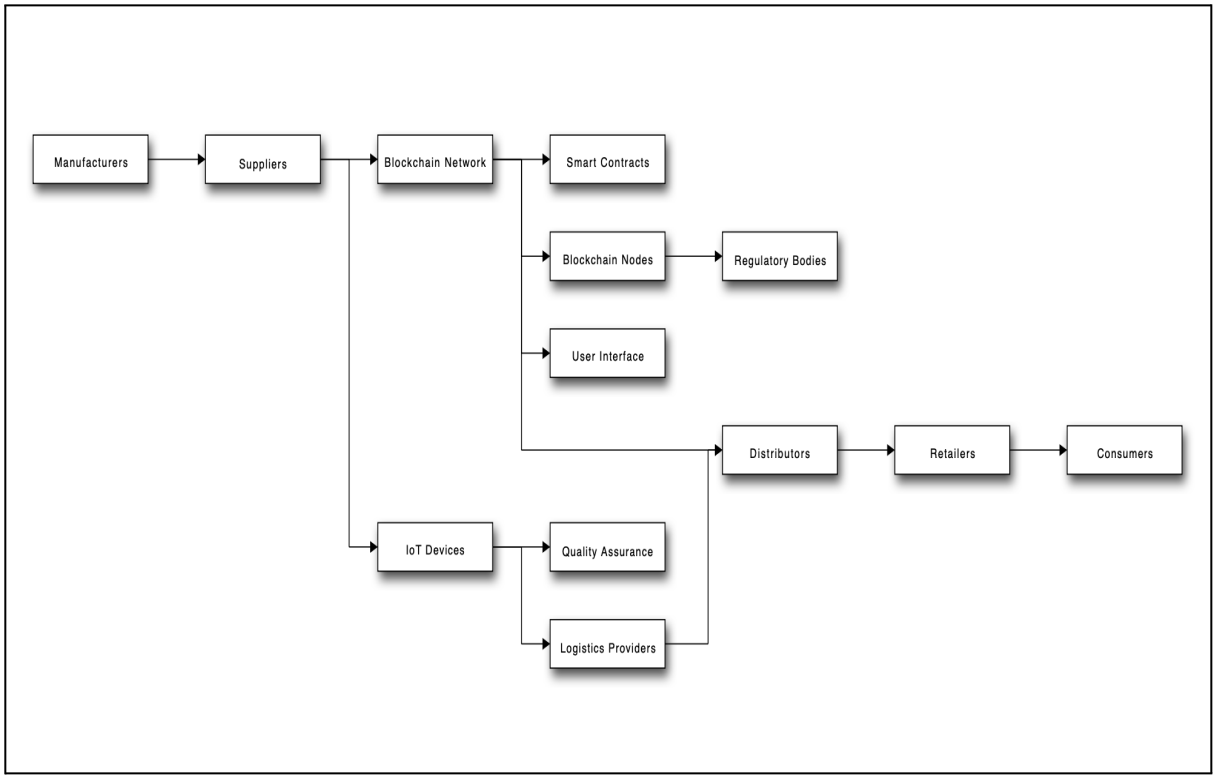

FIG.3.2 Architecture Of The Supply Chain Management

3.3 Details of Hardware & Software

Hardware details:

- Processor: Intel(R) Core(TM) i5-10300H CPU @ 2.50GHz 2.50 GHz
- Memory (RAM): 8.00 GB DDR4
- Storage: 512 GB SSD

Software details:

- Hardhat: For initial contract development and testing
- Python
- IDE - Visual Studio Code

3.4 Experiment and Results

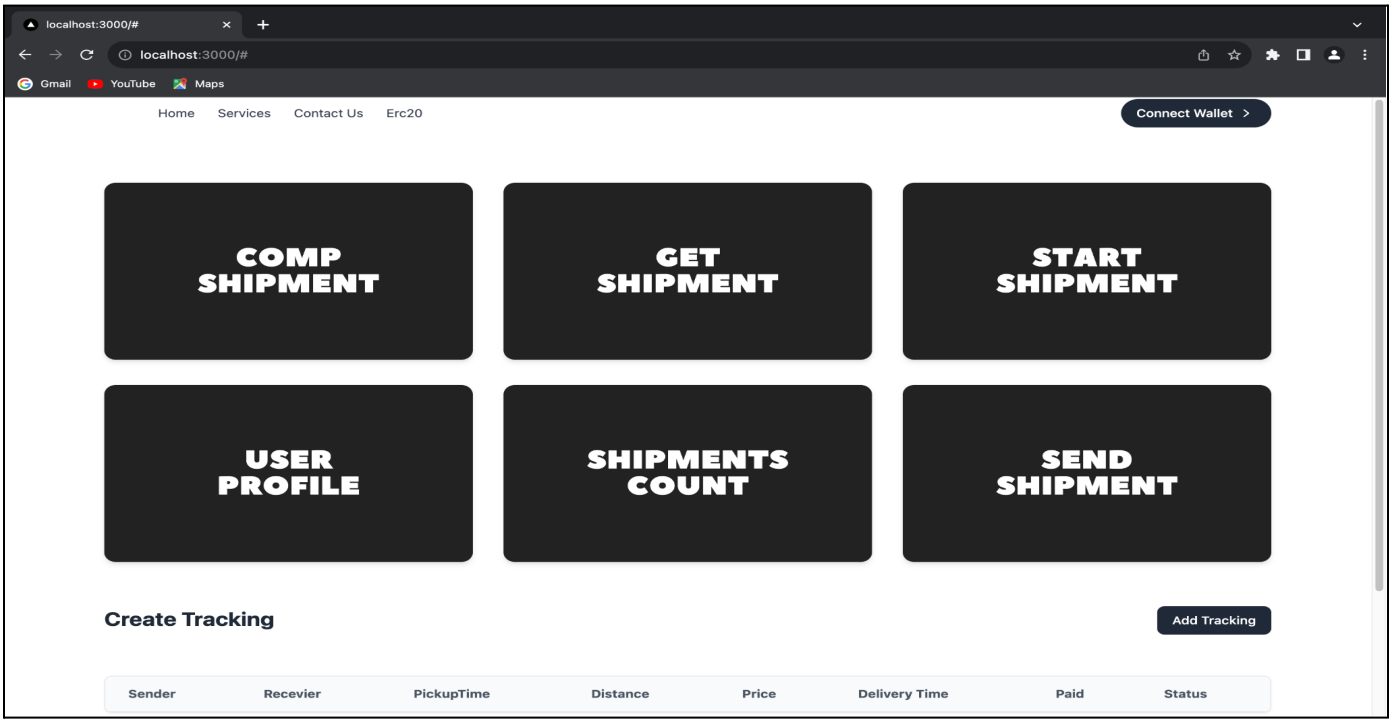

FIG 3.4.1 User Interface

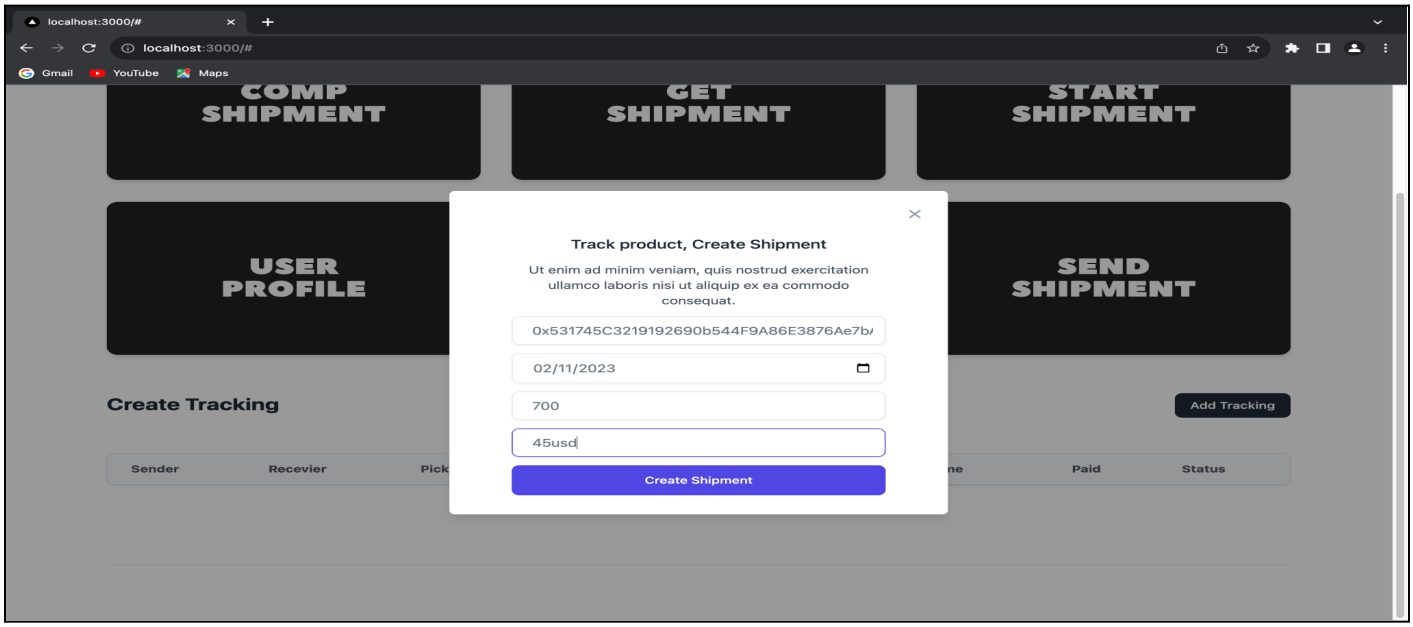

FIG 3.4.2 Adding Product For Tracking

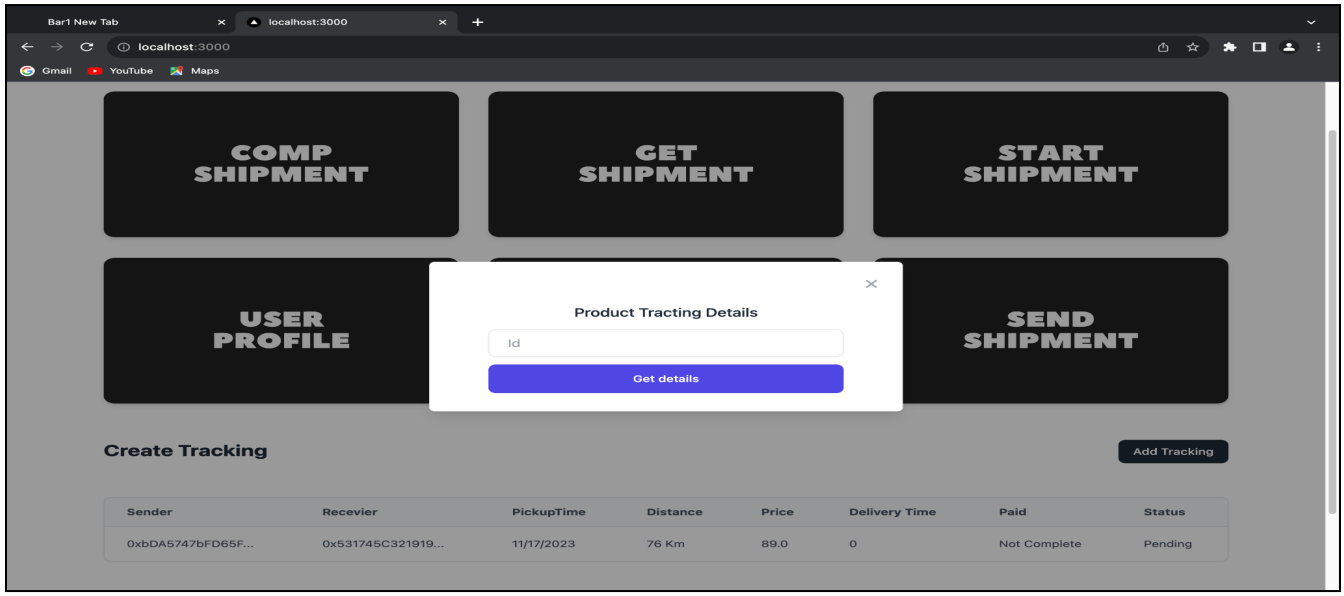

FIG 3.4.3 Getting Shipping Details

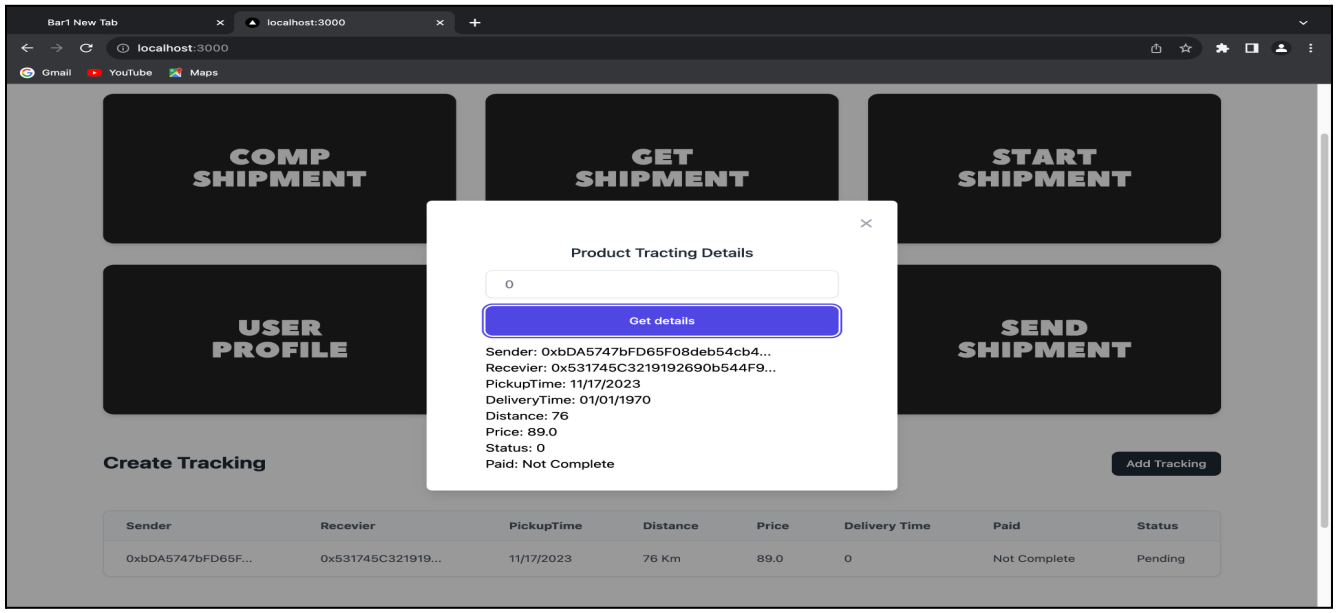

FIG 3.4.4 Fetch Shipment Details

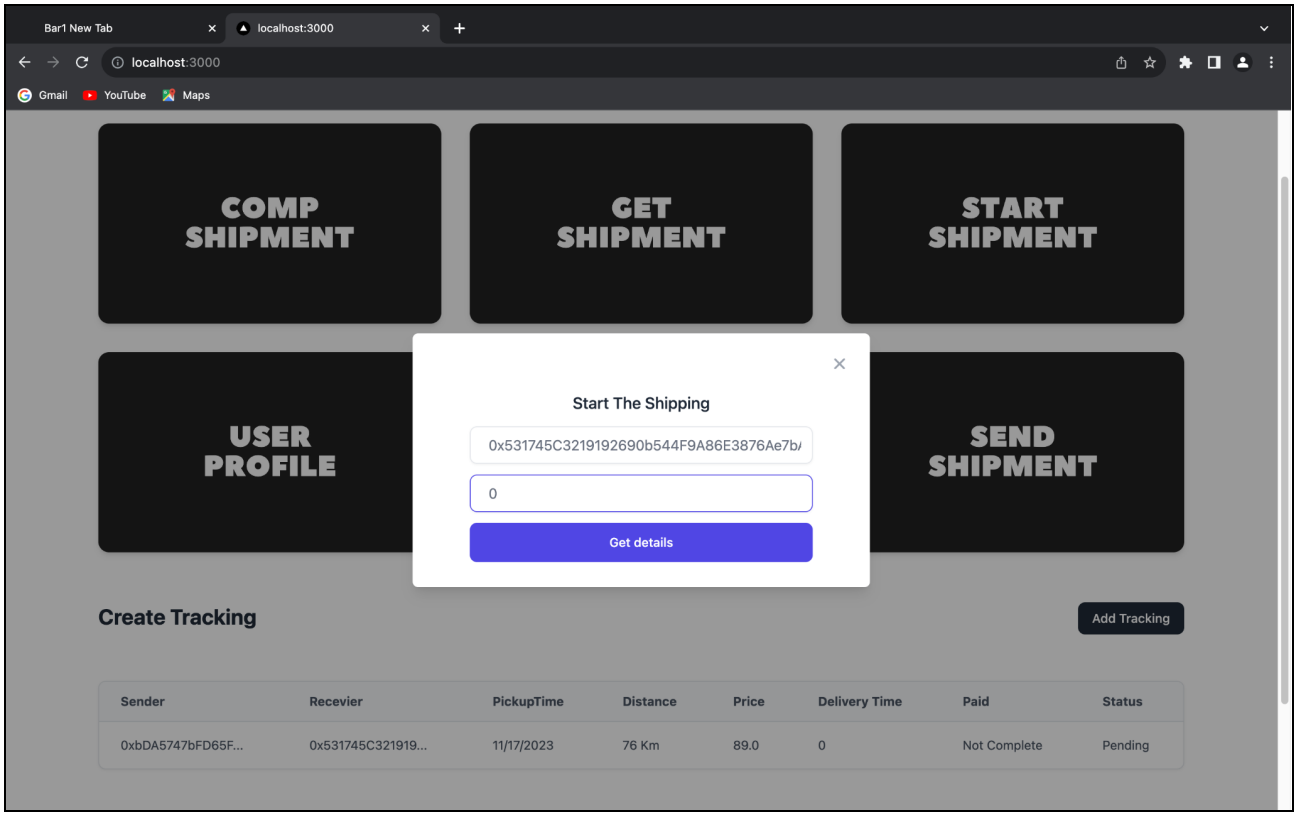

FIG 3.4.5 Starting the Shipment

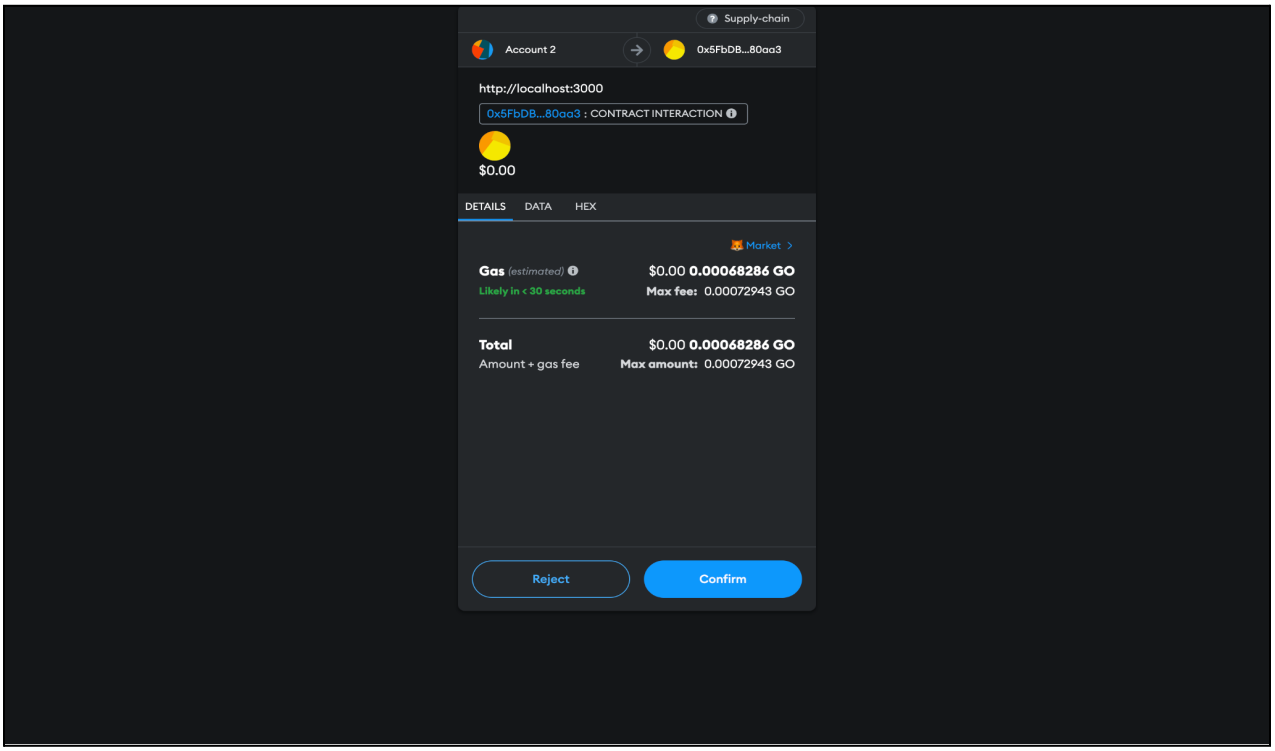

FIG 3.4.6 Signing the Transaction

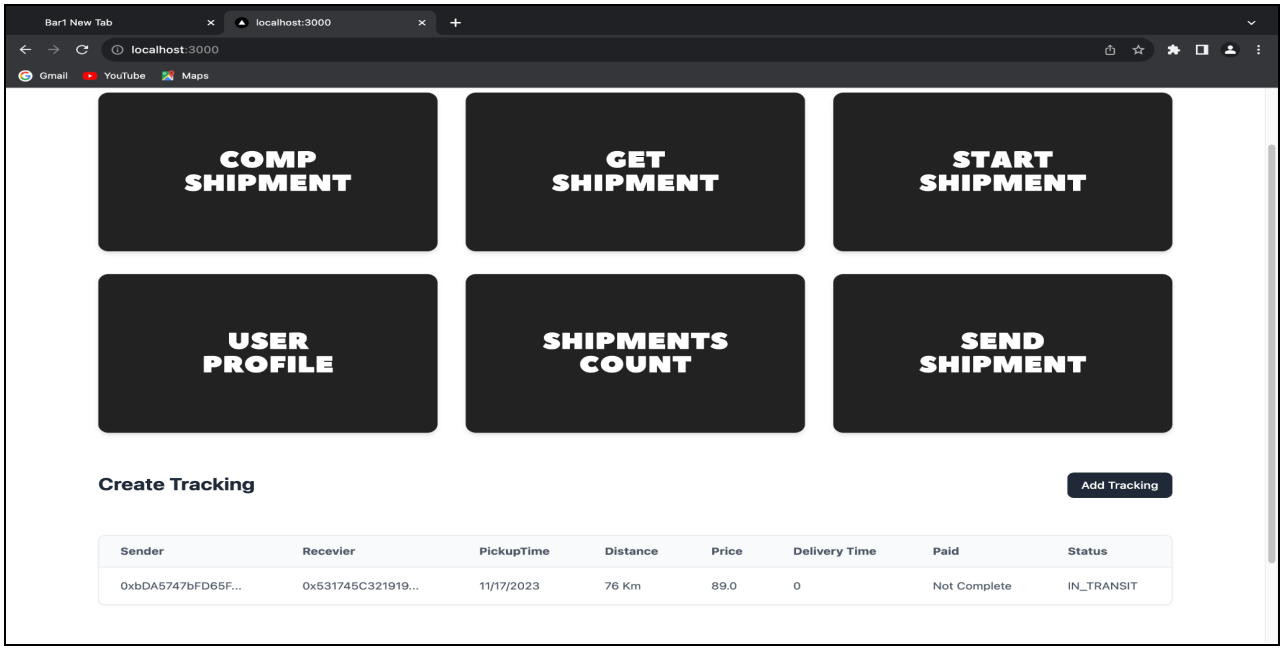

FIG 3.4.7 Shipment Started

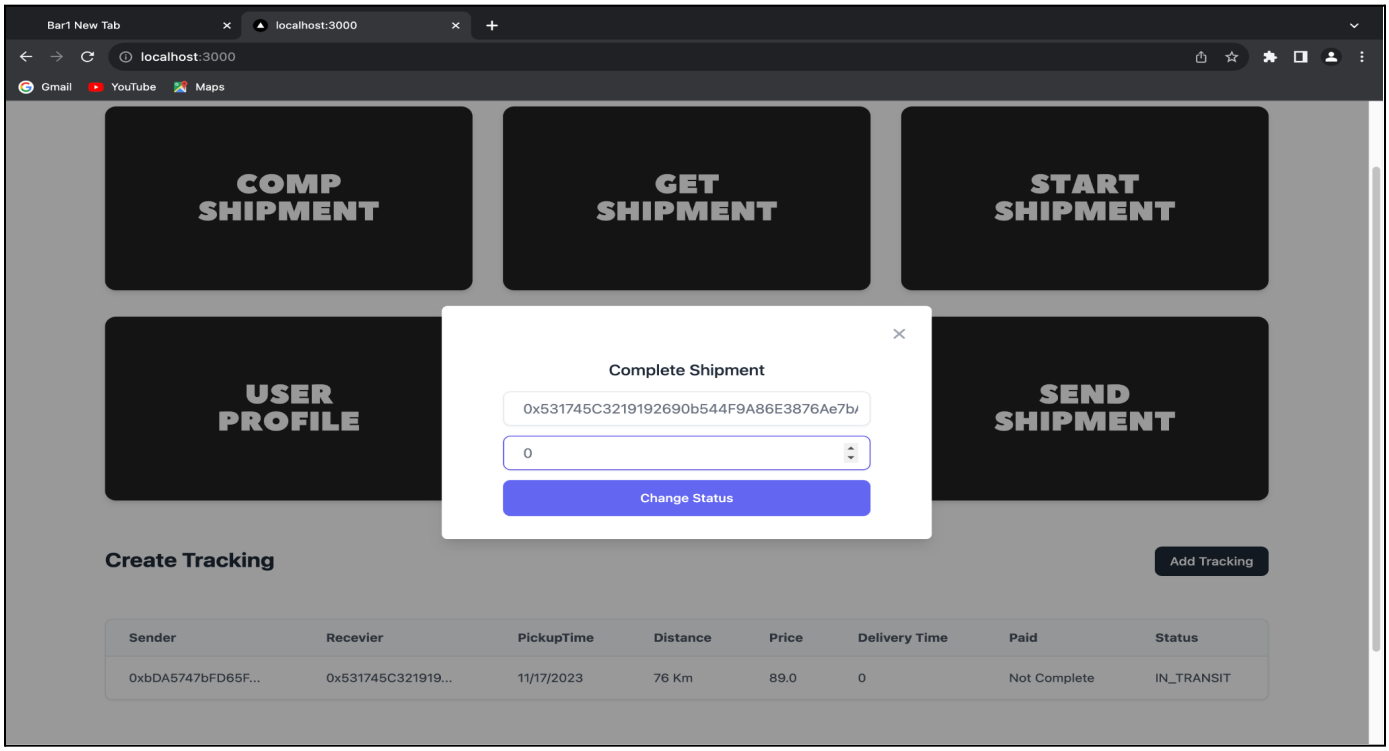

FIG 3.4.8 Completing The Shipment

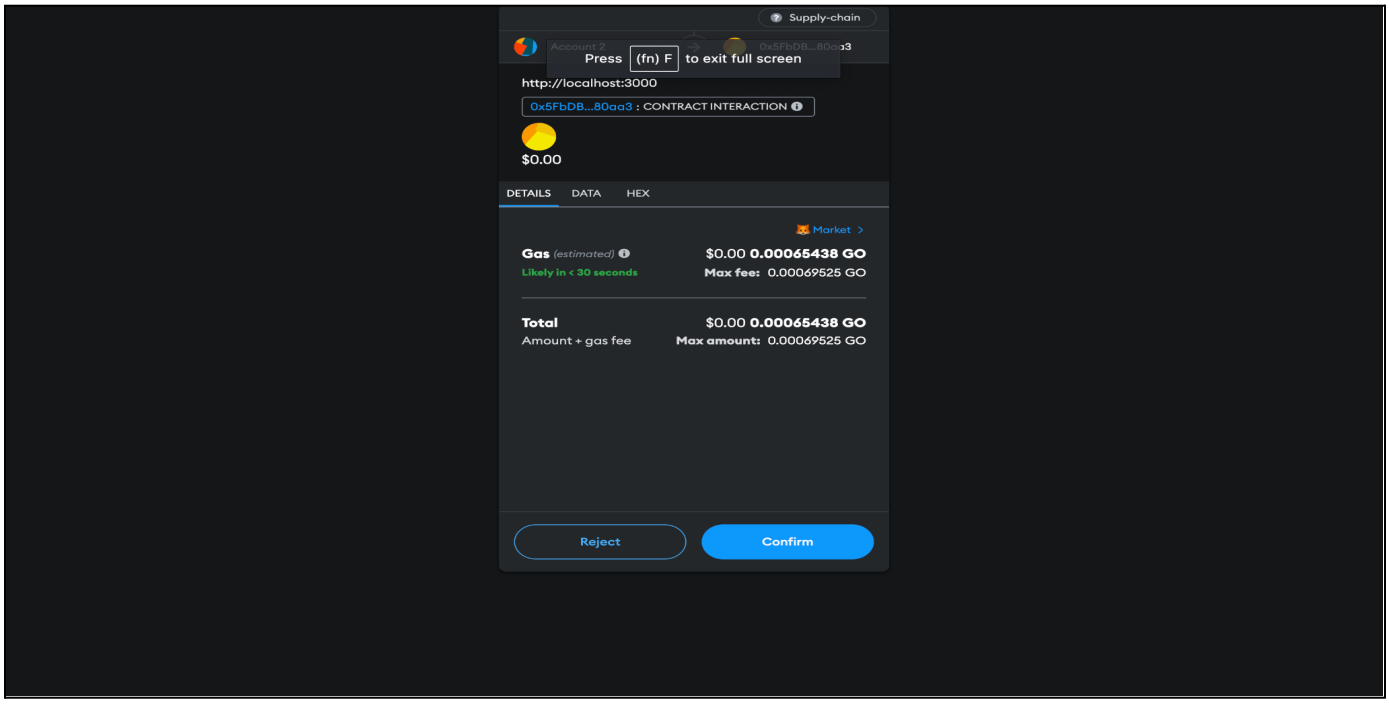

FIG 3.4.9 Signing the Transaction

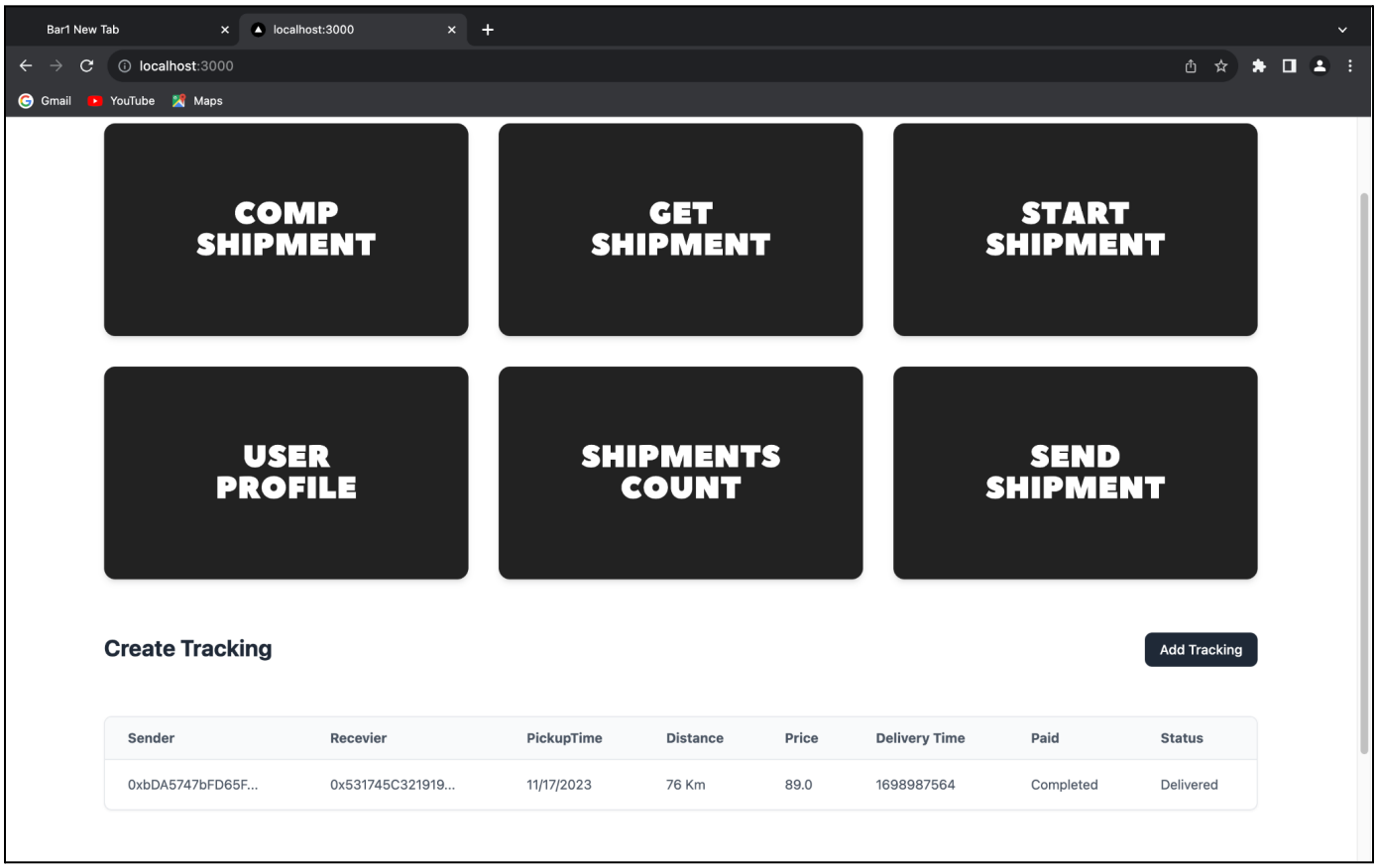

FIG 3.4.10 Shipment Completed

3.5 Result Analysis

Cost Savings: Compare the costs before and after blockchain implementation. This includes reductions in paperwork, improved inventory management, decreased need for intermediaries, and fewer errors and fraud.

Operational Efficiency: Measure the time taken for various supply chain processes before and after blockchain implementation. Look for improvements in procurement, logistics, and settlement times.

Traceability and Transparency: Assess the ability to trace items throughout the supply chain. With blockchain, every transaction is recorded and cannot be altered, improving the traceability of goods and the transparency of the process.

Quality Assurance: Determine if blockchain has helped in identifying and resolving quality issues more efficiently. Blockchain can provide detailed tracking of products, which can be used to quickly isolate and recall defective items.

Regulatory Compliance: Evaluate how blockchain helps in meeting regulatory requirements. Blockchain can help with compliance by providing a secure and unalterable record of all transactions.

Counterfeit Reduction: Analyze the impact on counterfeit goods. Blockchain's traceability features make it easier to verify the authenticity of products.

Partnership Synergy: Look at how blockchain has affected relationships with suppliers and customers. The improved transparency and data reliability can lead to stronger trust and collaboration between partners.

Data Analytics and Decision Making: Examine how the implementation of blockchain has affected decision-making processes. The availability of real-time data and analytics can help in making more informed decisions.

Market Responsiveness: Measure changes in how quickly the company can respond to market changes or demands, benefiting from improved visibility in the supply chain.

Risk Management: Evaluate how blockchain has affected the identification and mitigation of risks in the supply chain. The increased visibility and traceability can lead to better risk management.

Customer Satisfaction: Survey customers before and after blockchain implementation to gauge changes in customer satisfaction, which can be influenced by factors like product authenticity, delivery times, and product availability.

Sustainability: Consider the impact on sustainability efforts. Blockchain can help in tracking the environmental impact of products and ensuring responsible sourcing.

3.6 Conclusion

The adoption of blockchain technology in supply chain management holds immense promise. It offers transparency, traceability, and security benefits that can transform the way supply chains operate. Real-world applications and case studies have demonstrated the positive impact of blockchain, particularly in reducing fraud, streamlining processes, and enhancing collaboration. However, challenges such as scalability, integration complexity, and regulatory compliance remain to be addressed. As the technology matures and standards evolve, these challenges can be mitigated.

Future work in Supply Chain Management using Blockchain should focus on several areas. First, efforts should be made to improve the scalability of blockchain networks to handle the high transaction volumes inherent in supply chains. Interoperability standards should be developed to facilitate seamless integration with existing systems. Research into the environmental impact of energy-consuming blockchain networks should continue, with a focus on sustainability. Furthermore, the development of user-friendly interfaces and educational resources can enhance user adoption.

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