Supply Chain Management using Smart Contract and Blockchain

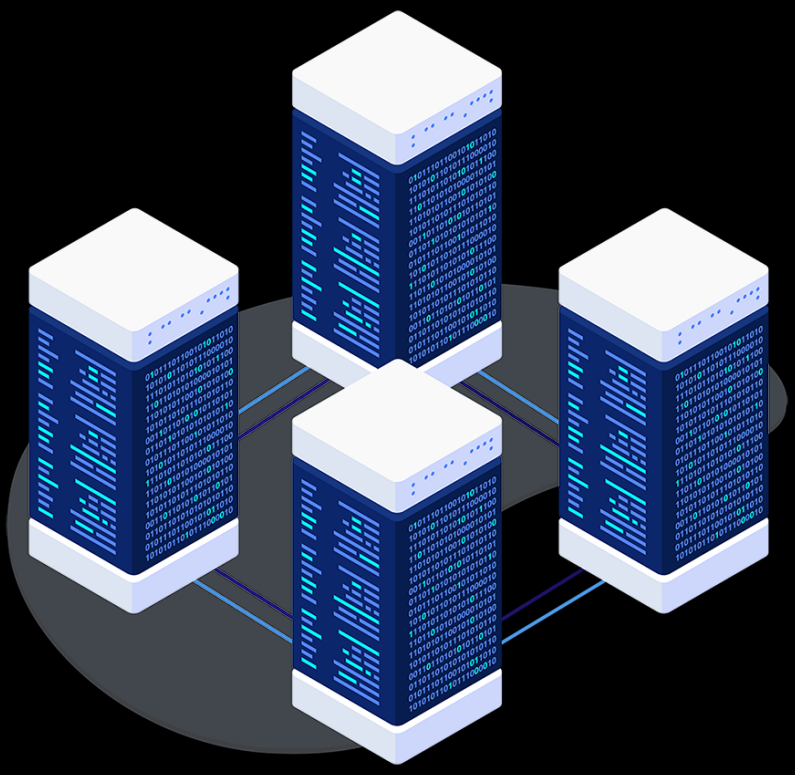
By:

- Abdullah A
- Kei Kasai
- Dileepa Dharmasiri
- Arun Prasad
- Romain Williams

SUPPLY CHAIN ON SMART CONTRACT:

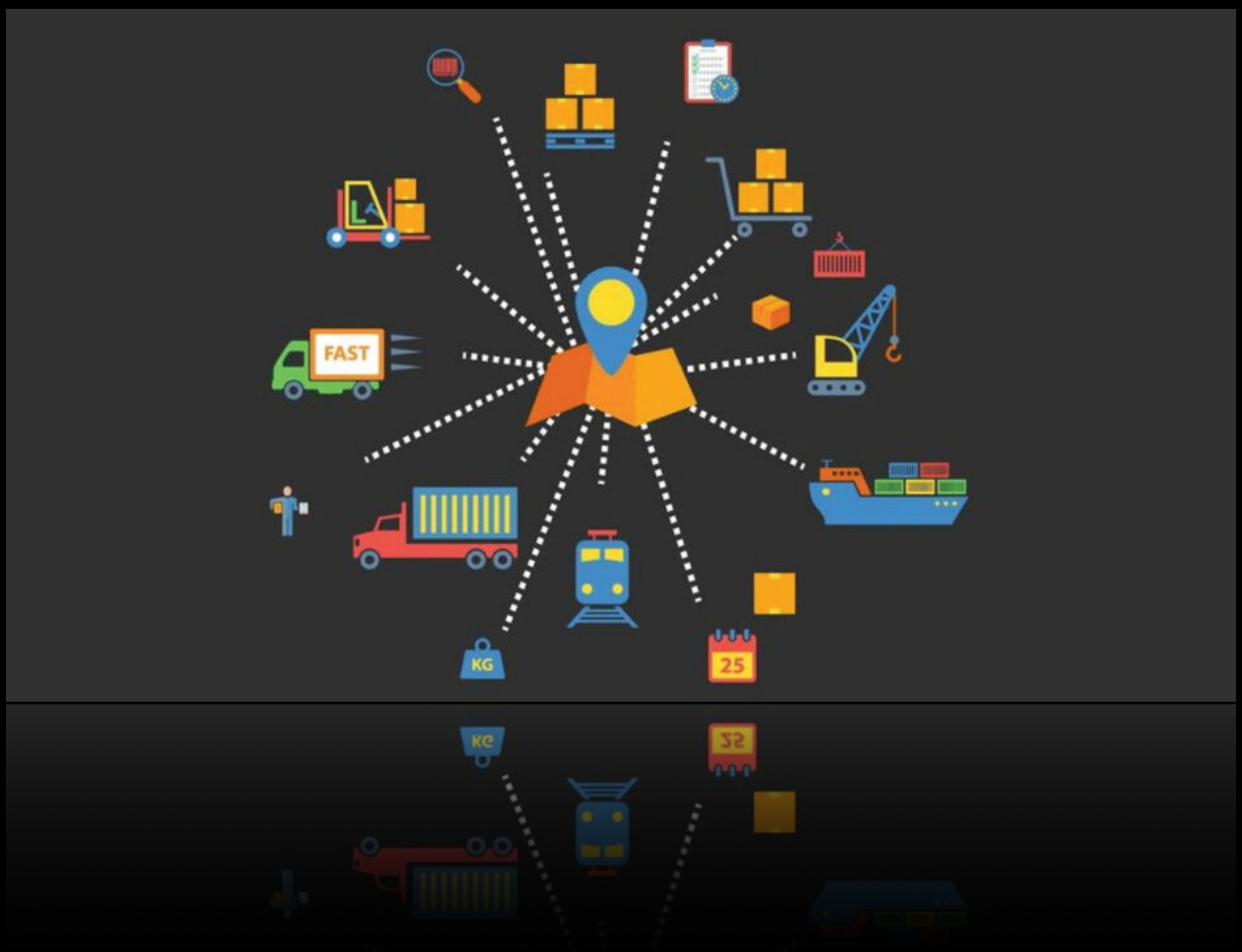
In the world of business, supply chain management plays a vital role in ensuring that products are delivered efficiently and effectively to customers. However, managing a supply chain can be a challenging task, especially when it comes to ensuring transparency, security, and accountability. This is where blockchain technology and smart contracts come in. By using these technologies, we can create a more efficient and trustworthy supply chain management system.

managing the supply chain is a complex process involving multiple stakeholders and intermediaries, making it difficult to track the movement of goods and services accurately.

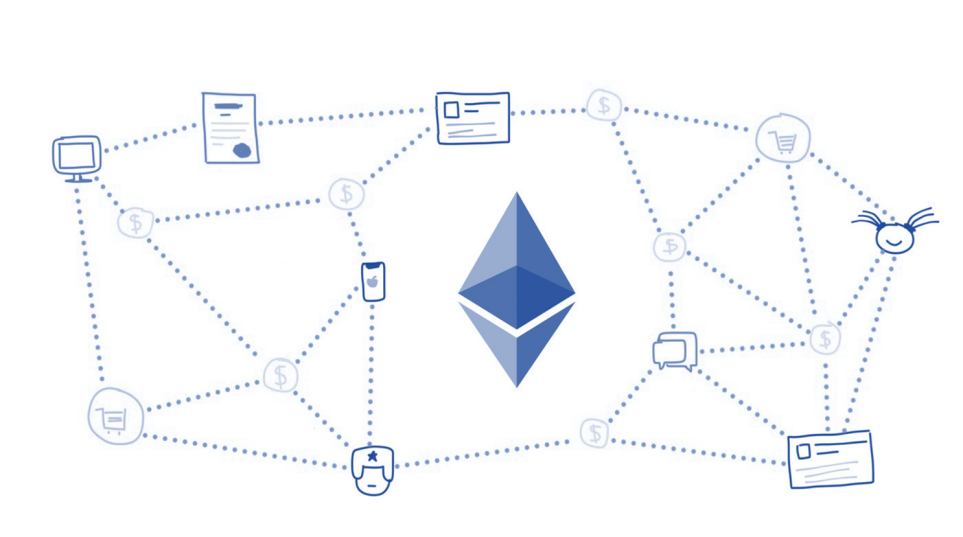


The Challenges in Traditional Supply Chain Management:

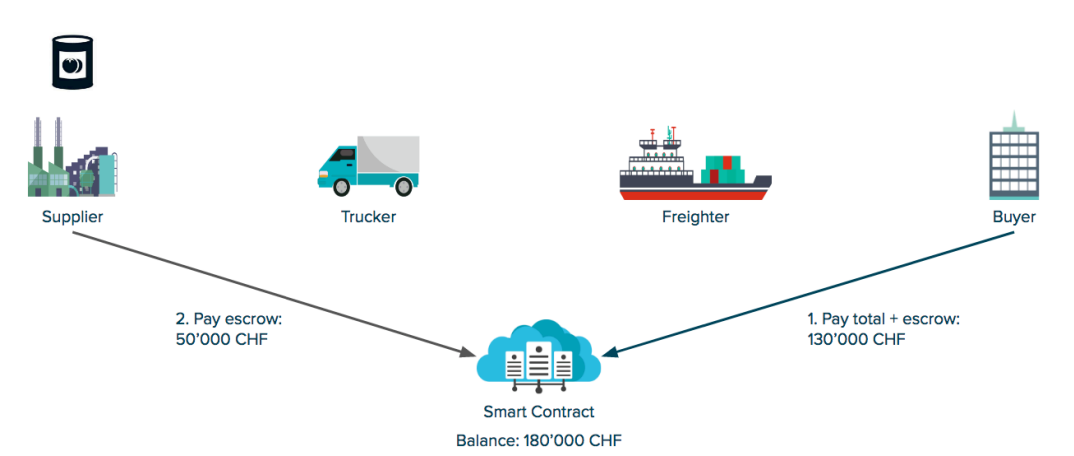
Traditional supply chain management poses various challenges such as lack of transparency, counterfeiting, and supply chain inefficiencies. Companies face difficulties in ensuring product authenticity, quality, and reliability in traditional supply chain management.



The Benefits of Supply Chain Using Smart Contracts and Blockchain:

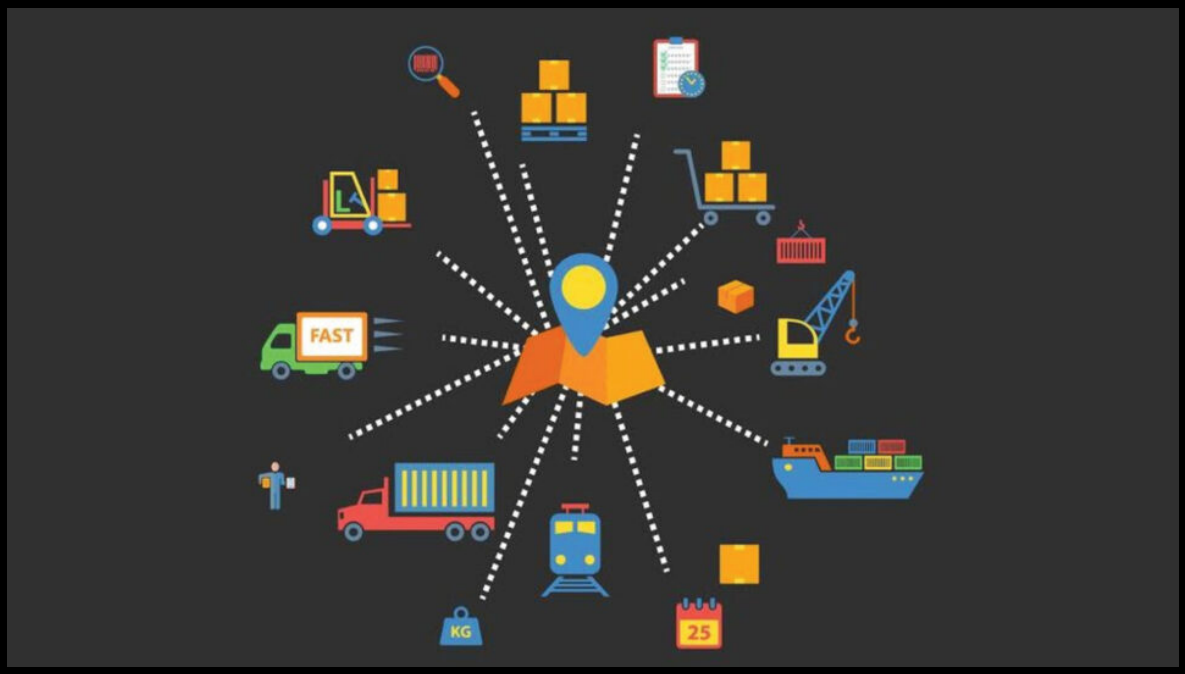


Smart contracts and blockchain technology can provide a solution to the challenges faced in traditional supply chain management. The use of smart contracts and blockchain can enhance supply chain transparency, reduce the risk of counterfeiting, and improve supply chain efficiency. By using blockchain technology, the movement of goods and services can be tracked transparently, providing a clear view of the supply chain to all stakeholders.



How Smart Contracts Work:

Smart contracts are self-executing digital contracts that automatically enforce the terms of the agreement between the two parties. These contracts are stored on a decentralized blockchain network, making them tamper-proof and transparent. Once the terms of the contract are met, the smart contract automatically executes the transaction, eliminating the need for intermediaries.



Implementation of Smart Contracts in Supply Chain Management:

Smart contracts can be used in supply chain management to automate and streamline the process. For example, a supplier can create a smart contract with the details of the product, including its name, quantity, price, and delivery date. Once the buyer and the supplier agree to the terms of the contract and sign it digitally using their private keys, the buyer can send the payment to the smart contract's address.

Benefits of Using Smart Contracts in Supply Chain Management:

The use of smart contracts in supply chain management has several benefits, such as increased transparency, reduced transaction costs, and improved efficiency. Smart contracts can provide a clear view of the supply chain to all stakeholders, making it easier to track the movement of goods and services. By eliminating intermediaries, smart contracts can reduce transaction costs and improve efficiency.

Smart contract (Code explaining)

The contract defines a Product struct that contains details about the product to be delivered, such as its name, quantity, price, and delivery date.

It also defines a Contract struct that contains details about the contract between the buyer and supplier, such as the product details, the buyer's address, the logistics provider's address, the payment amount, and whether payment and delivery have been completed.

The **contracts** mapping is used to keep track of all the contracts that are created, and the contractIds array is used to store the ids of all the contracts.

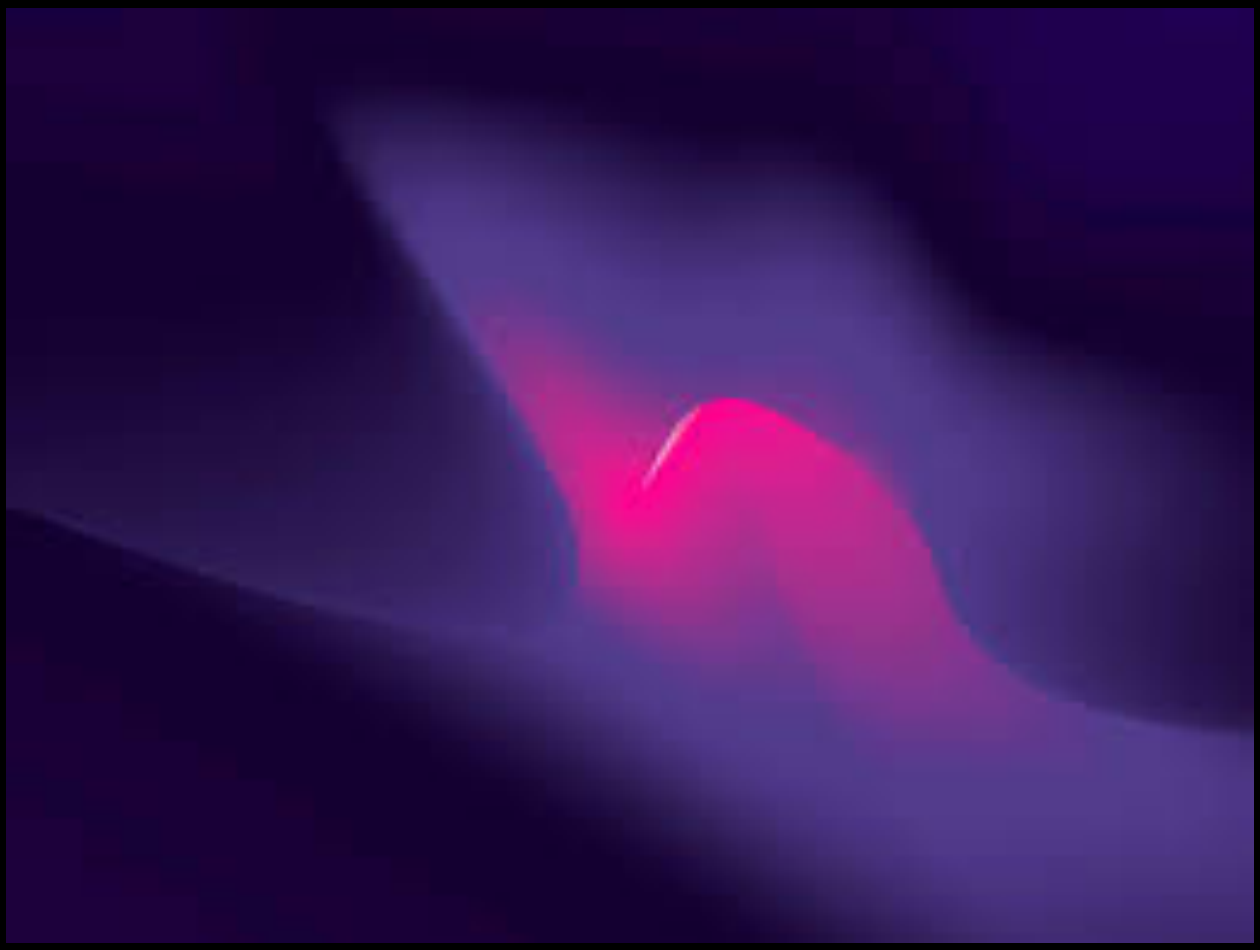
The **createContract** function creates a new contract, generates a unique ID for the contract, and adds it to the mapping and array.

The **sendPayment** function is used by the buyer to send payment to the contract. It verifies that the payment matches the contract amount and marks the payment as done.

The **recordDelivery** function is used by the logistics provider to record the delivery of the product. It verifies that the sender is the logistics provider and marks the delivery as done.

The **confirmTransaction** function is used by the buyer to confirm that the delivery has been done and the payment has been made, and release the payment to the supplier. It verifies that the sender is the buyer, that the delivery and payment are complete, and releases the payment to the supplier.

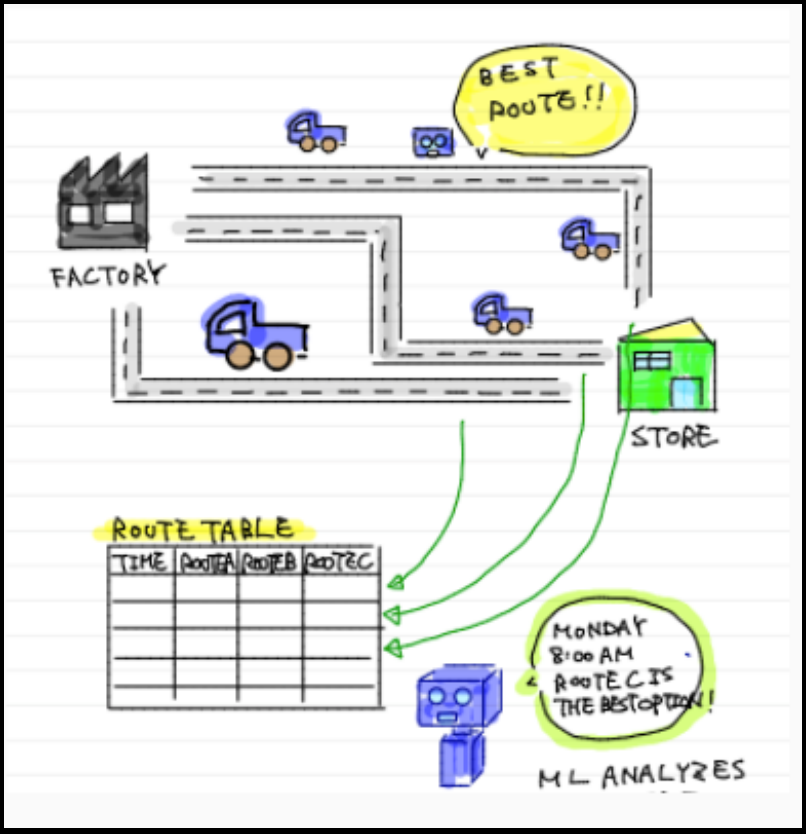
Data Sorting:



Gradient boosting regression is known for its high prediction accuracy and ability to handle complex datasets. This is one of the main reasons why I used. The low values of mean squared error, Root Mean Squared Error, and Mean Absolute Error indicate that the model has good predictive performance.

Machine Learning:

We don’t stop at blockchain technology! We can utilize the power of machine learning to analyze data the moment when it is arrived. We can analyze drivers data from warehouse to store to predict the best route considering time, fuel economy, and other factors. We will maximize loading capacity not to run empty cargo.



(Used features)

RandomForestRegressor for machine learning
Pickle library to save ML model
Nominatim library to convert address to longitude and latitude
Nbconvert to convert Jupyter Notebook file to py file
Flask for front end
Bootstrap 5 for front end design

Conclusion:

In conclusion, the use of smart contracts and blockchain technology can revolutionize the supply chain management process. By providing transparency, security, and efficiency, smart contracts can enhance the overall supply chain experience for all stakeholders. Implementing smart contracts in supply chain management can lead to reduced transaction costs, improved efficiency, and increased trust among stakeholders.