BLOCKCHAIN IN SUPPLYCHAIN FOR
TIMBER TRACKING

TroonDx
Engineering Trust at Scale

DLT based traceability minimizes errors and increases trust and visibility of wood through the Supply Chain

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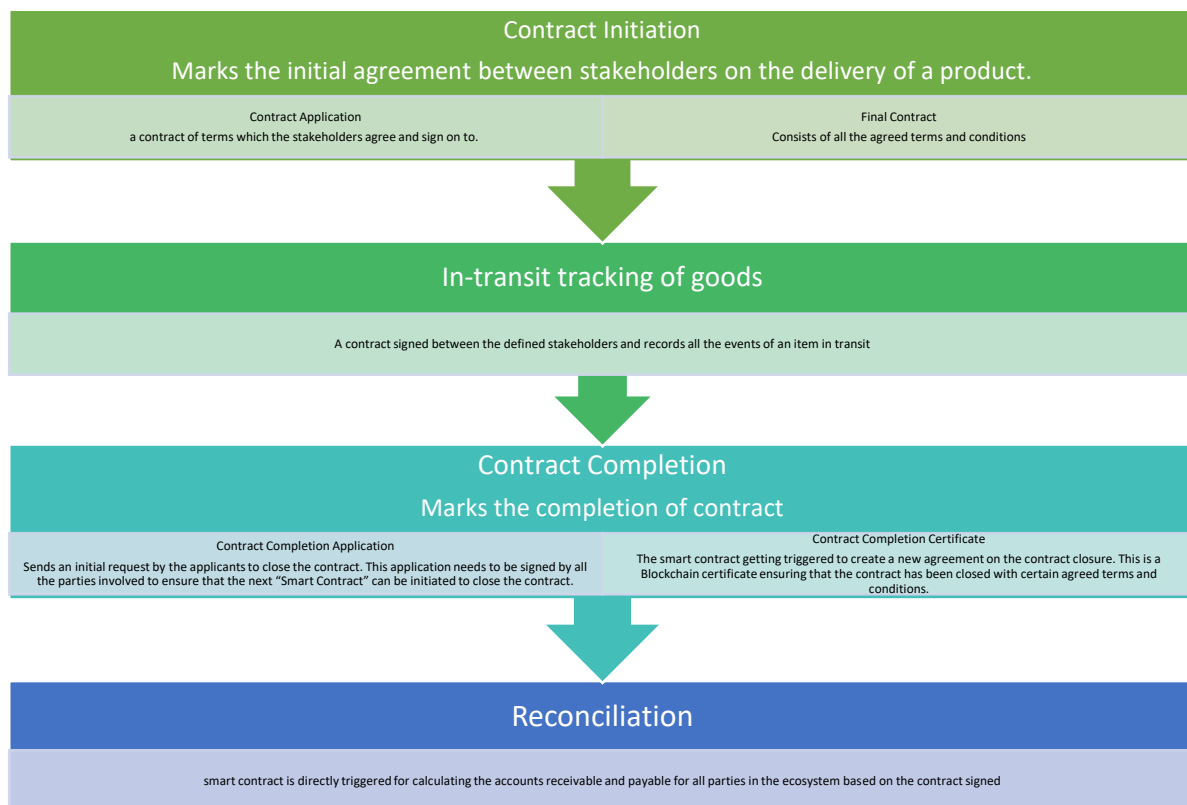CoFounder, TroonDx

Objective:

> Like any other industry, tracing products through the supply chain is important for timber products from a standing tree to all its way to an end product to keep a track of its origin and verify its authenticity.

We built a minimum viable product that ensure there's enough visibility about the entire lifecycle of logs from production, harvest to its processing of timber woods at the mills.

Our Approach:

Designing the Process

The entire process flow is separated into four primary areas –

Contract Initiation
Marks the initial agreement between stakeholders on the delivery of a product.

Contract Application	Final Contract
a contract of terms which the stakeholders agree and sign on to.	Consists of all the agreed terms and conditions

In-transit tracking of goods

A contract signed between the defined stakeholders and records all the events of an item in transit

Contract Completion
Marks the completion of contract

Contract Completion Application	Contract Completion Certificate
Sends an initial request by the applicants to close the contract. This application needs to be signed by all the parties involved to ensure that the next "Smart Contract" can be initiated to close the contract.	The smart contract getting triggered to create a new agreement on the contract closure. This is a Blockchain certificate ensuring that the contract has been closed with certain agreed terms and conditions.

Reconciliation

smart contract is directly triggered for calculating the accounts receivable and payable for all parties in the ecosystem based on the contract signed

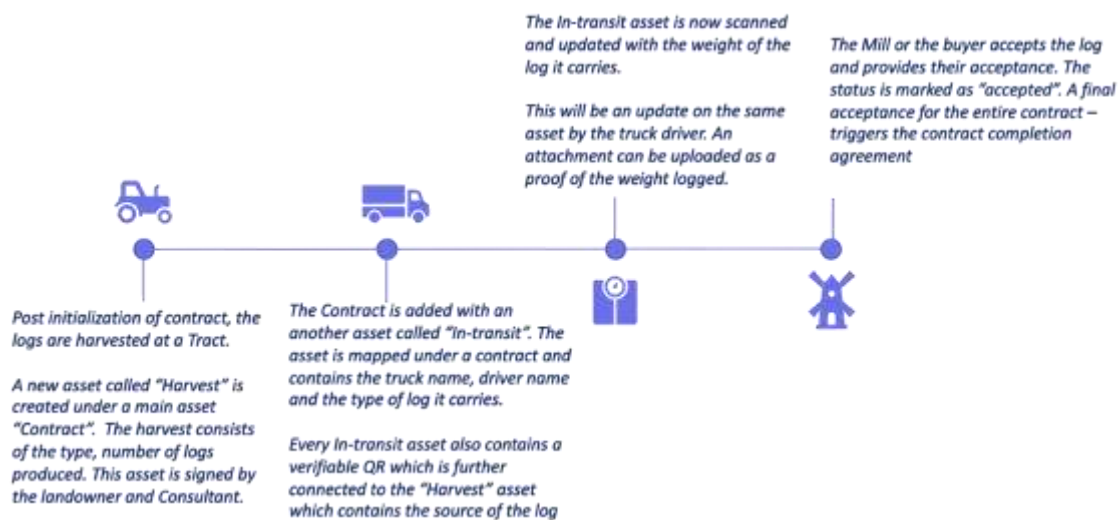Let us explain in detail with four scenarios:

Scenario I - Contract Initiation

An initial application for setting up a contract will be triggered, this will ensure that all the parties between whom the contract needs to be setup mutually agree to the terms and conditions of the contract. Agreeing and verifying to this transaction triggers the actual contract below.

A contract is signed for a tract between a consultant and Wood dealer. The contract consists of the following items such as

a.   Harvest ID
b.   Contract Application ID
c.   Consultant details
d.   Commission Percentage
e.   Sale owner
f.   Dealer Details
g.   Product Details

Scenario II - In Transit Transaction

The In-transit asset is now scanned and updated with the weight of the log it carries.

This will be an update on the same asset by the truck driver. An attachment can be uploaded as a proof of the weight logged.

The Mill or the buyer accepts the log and provides their acceptance. The status is marked as "accepted". A final acceptance for the entire contract – triggers the contract completion agreement

Post initialization of contract, the logs are harvested at a Tract.

A new asset called "Harvest" is created under a main asset "Contract". The harvest consists of the type, number of logs produced. This asset is signed by the landowner and Consultant.

The Contract is added with an another asset called "In-transit". The asset is mapped under a contract and contains the truck name, driver name and the type of log it carries.

Every In-transit asset also contains a verifiable QR which is further connected to the "Harvest" asset which contains the source of the log

Scenario III: Contract Completion

As mentioned during the initial application, a similar process will be followed for contract completion and, finally the said contract will be marked complete.

a.   Contract ID
b.   Timestamp
c.   Created By
d.   Approved by Buyer
e.   Transit ID
f.   Weight Slip ID (This will be an array of weight slips for various product types)

Scenario IV: Reconciliation

Reconciliation occurs at the time of a contract completion. The smart contracts based on the agreed contract auto-calculates the account receivables and the net payable for the stakeholders of the system.

Salient Advantages of the above system:

1. **A complete visibility of the entire ecosystem -** A Simple query by Contract ID will provide an immutable audit trail information from source to the final stage of contract getting closed
2. **No Middle men and No approval -** Using a predefined set of rules, a new transaction gets invoked on the completion of a previous transaction
3. **Near Real-time visibility of all transactions -** An immediate visibility of all real time transaction at near real time (delay could be seen based on network availability and updation)
4. **Offline storage of information** - Data can be stored offline and synced in based on the network availability

Technical Architecture Design:

The architecture discussed below focuses on the below main points:

1. The overall architecture set-up to handle load and multiple transactions
2. Application Programmable Interface and Containerization
3. Authentication & Information Exchange using TroonDx SineID
4. Data Classification & sharing
5. TroonDx Insights Integration

Architecture set-up

- The client will be a mobile/web application
- The client will raise a https request across to the Kubernetes cluster, the kubernetes cluster used is capable of horizontal scaling based on CPU usage
- Kubernetes cluster further progressively rolls out changes to the application, while monitoring its health to ensure it doesn't kill all the instances at the same time
- Every node in the cluster further holds a docker container with the various elements of the application (TroonDx platform exposes the docker images of all the microservice APIs defined)
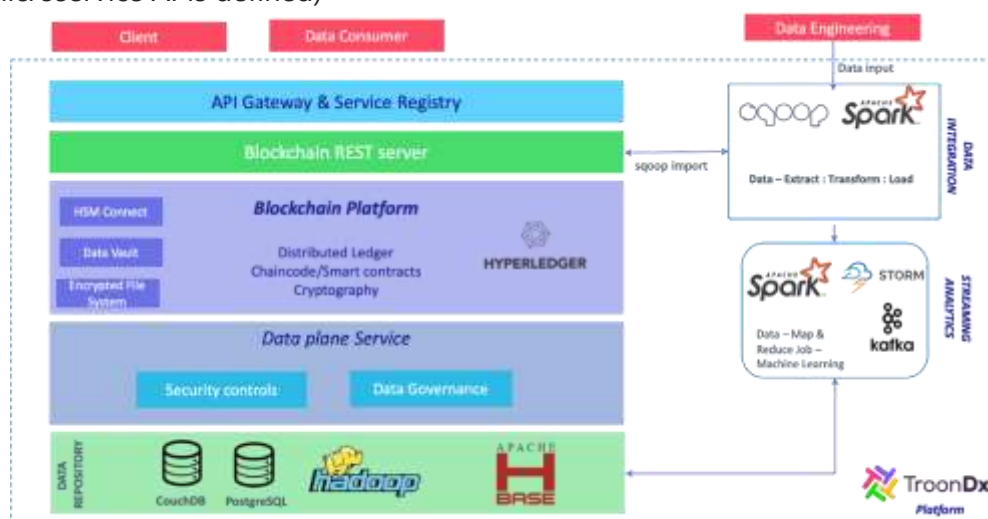
API Gateway and Containerization

- Every node in the cluster holds a docker container, which further holds the entire set of APIs deployed on a docker
- This enables easy deployment and keeps the architecture in-dependent of the cloud infrastructure
- The various APIs include - Auth API, Hyperledger API, Data API and 3rd party API
- Each of these APIs have got a seperate function and are independent from one another; making the architecture microservice driven and fail proof

2. ***Auth & TroonDx APIs***
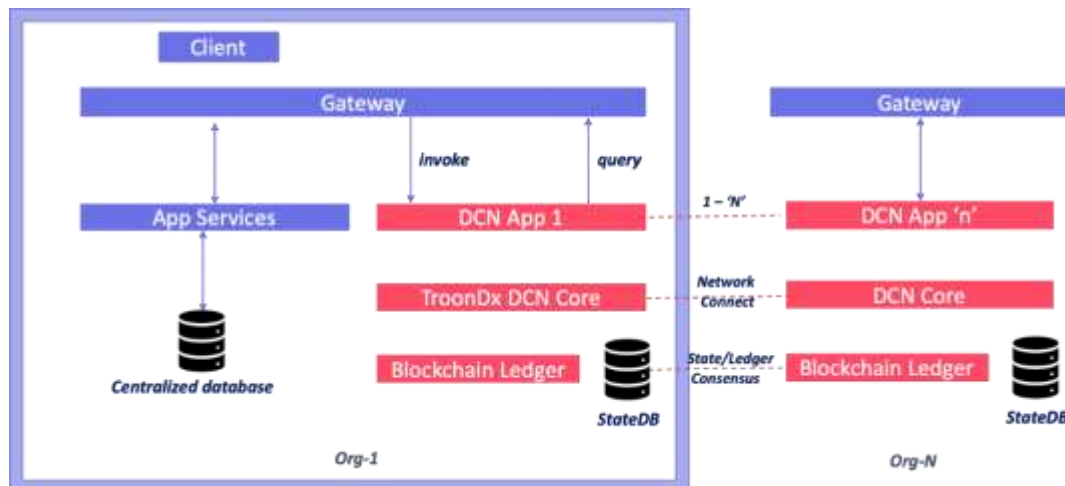
The above image shows how multiple orgs can connect using TroonDx platform

- Every user addition, authentication, permissions and roles are stored as chain code within the TroonDx SineID ecosystem. This can also be used to decentralize and verify transactions in the system
- The users can also sign-in to the system using passwordless biometric signatures
- The entire set of data gets encrypted by the respective private key of the users and is stored on the nosql database (CouchDB/MongoDB)

The below points highlight the various transactions within the TroonDx Platform

- The transaction proposal is submitted by an application to an endorsing peer.
- The Endorsement policies outline how many and/or what combination of endorsers are required to sign a proposal. The endorser executes the chaincode to simulate the proposal in the network peer, creating a read/write set.
- Then the endorsing peers send back the signed proposal responses (endorsements) to the application.
- The application submits the transactions and signatures to the ordering service, which
- Creates a batch, or block, of transactions and delivers them to committing peers.
- When a committing peer receives a batch of transactions, for each transaction it Validates that the endorsement policy was met and checks in the read/write sets to detect conflicting transactions. If both checks pass, the block is committed to the ledger, and the state updates for each transaction are reflected in the state database.

The Output

A transparent, immutable system that help industry to manage transactions efficiently, and could lead to economic sustainability.

Blockchain has significant potential for facilitating transparency, reliability, security, and traceability in every sector but it could be vulnerable to hacking when the smart contract with the relative software procedures are not properly designed.

TroonDx is a scalable Blockchain-based Intelligence platform that has employed innovative methods for tackling data and insight related challenges faced by Blockchain networks and stand-alone analytical frameworks.

We believe TroonDx will enable every industry to reach greater levels of efficiency and supply chain visibility using Blockchain.

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