BeefChain

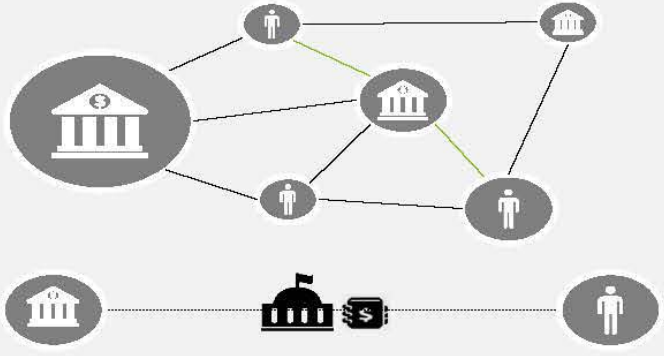

RANCH FAMILY
PASTURE
FEEDBACK
YOUR FAMILY
FINISHING PROCESSING
BeefChain
CONSUMER
UTILIZING BLOCKCHAIN TECHNOLOGY
WHOLESALER
RETAILER

What is blockchain?

Essence of blockchain technology:

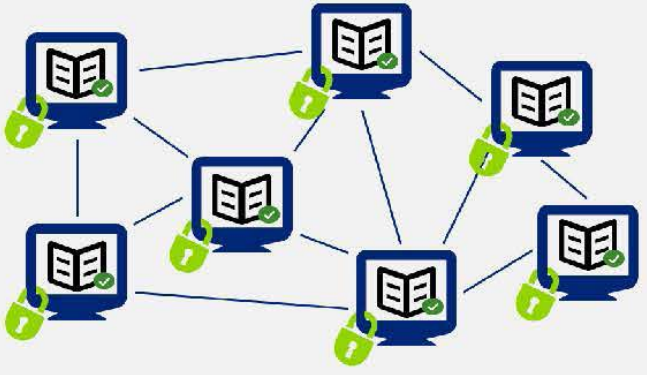
- A blockchain is a record, or ledger, of digital events
- It's "distributed" between many different parties
- It is only updated by consensus of the participants in the system
- Once recorded, information can never be changed
- The blockchain contains a certain and verifiable record of every single transaction ever recorded

Current System



- **Central authorities** transfers actual value between two parties
- **Multiple intermediaries** and **record-keeping** are required to create trust

Blockchain System



- **Distributed** network of computers (nodes) maintains a shared source of information.
- Transaction data is **immutable**
- **Trust** is enabled by **cryptographic** algorithm

When is blockchain useful?

Blockchain's unique value proposition is best captured in solutions where multiple independent parties need to interact with, update, or reference common set of data

Typical characteristics of blockchain use-cases:

Shared Data
Structured repository of information for multiple independent parties

Immutable
Un-editable records provide strong auditability

Transaction Interaction
Interaction or dependency between the transactions created by different entities

Multiple Writers
More than one entity generating transactions that modify the database

Absence of or Low Trust
Level of mistrust between the entities writing to the database (e.g., one user will not accept the "truth" as reported by another user)

Opportunity for Disintermediation
Lack of trusted intermediary or central gatekeeper to verify transactions

The level of trust or mistrust helps determine the network structure

Blockchain network structures:

Public Blockchain	Permissioned Blockchain	Private Blockchain
• Fully decentralized • Secured by economic incentives • Possibility of collusive actors • Slow confirmation of transactions • Limited privacy protection	• Quasi-decentralized • Consensus process preselected by nodes • Low chance of collusion • Near-real-time confirmation of transactions • Greater degree of privacy	• Centralized • Consensus process controlled by single entity • Real-time confirmation of transactions • Highest degree of privacy

LOWER TRUST IN SYSTEM OPERATORS → HIGHER TRUST IN SYSTEM OPERATORS

Common considerations to operationalizing blockchain

As the community becomes more familiar with blockchain, the conversation has shifted from hype to careful consideration of implementation and operation challenges

The following considerations must be addressed to deliver mature enterprise-level blockchain solutions:

Data privacy and security

Most blockchain applications require permissioned implementations, requiring carefully defined user permission levels and a tightly controlled consortia

Performance

Due to architectural differences, performance can vary dramatically by consensus mechanism, but the appropriate mechanism depends on the use case

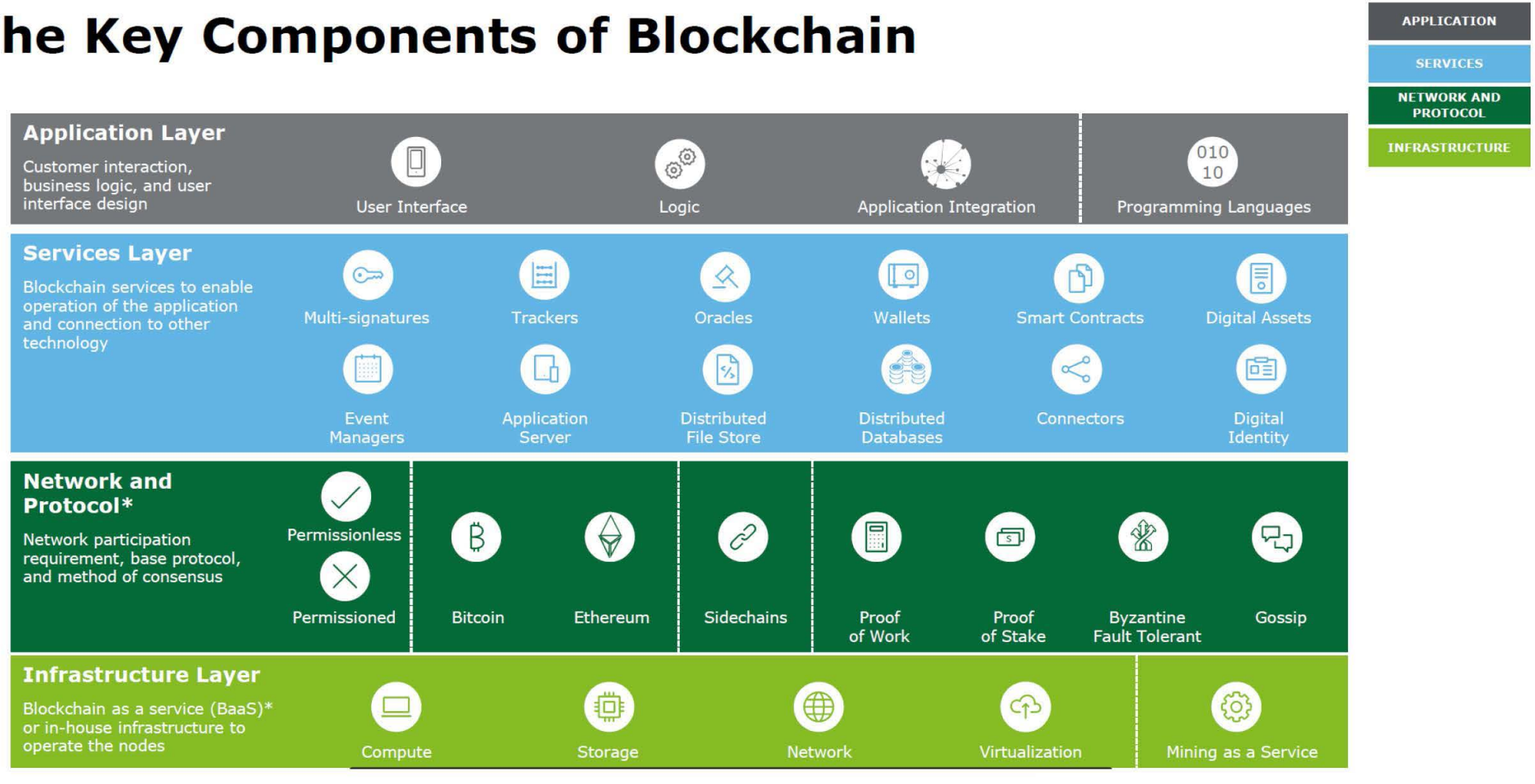
Interoperability

Leading blockchain products that realize differing parts of the value proposition are yet to integrate without various custom development workarounds

Regulatory: Government as the regulator & participant

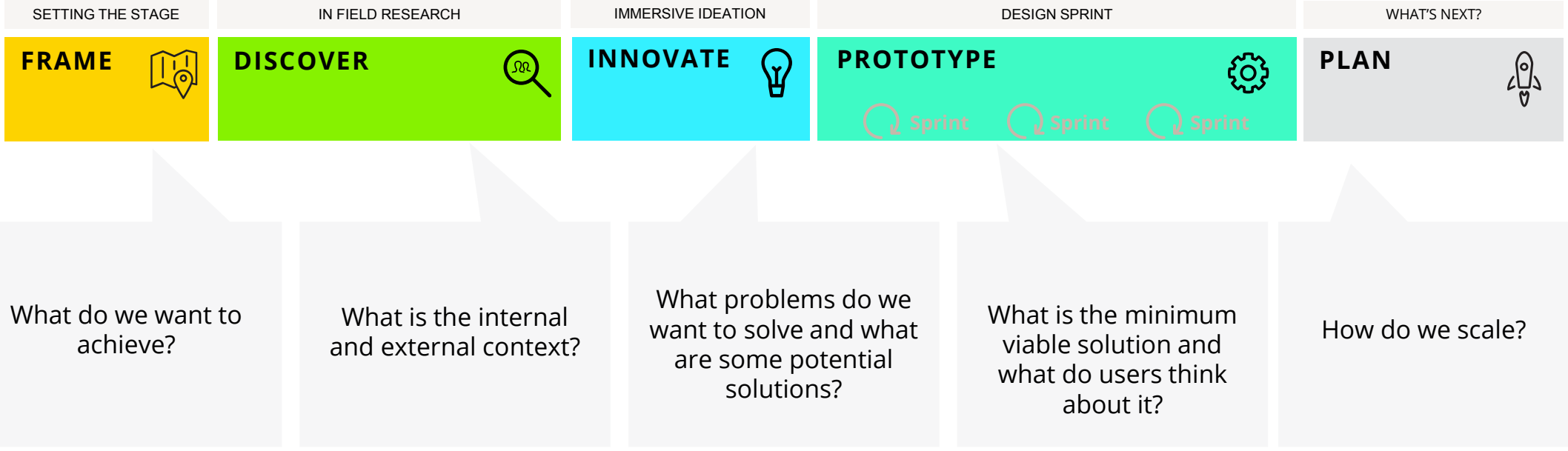
Public sector involvement in blockchain activities relies on a delicate balance between their type of participation and their imposed regulations

The tech stack is familiar looking



A REMINDER OF OUR APPROACH

Our five-step experimentation process



Our Objective for this Use Case

Using Deloitte's GovNext methodology this experiment aims to understand how the Canadian Food Inspection Agency could use blockchain to enhance sheep disease traceability in Canada

Objective

Conduct an experiment to understand the **potential opportunity** for the Canadian regulator to leverage blockchain to **improve sheep disease traceability** from Farm to Abattoir

Key questions

- What are some of the **current challenges** in tracing diseased sheep in Canada?
- How could blockchain help **address these challenges**?
- How might this **benefit** the Canadian Food Inspection Agency?
- What are the **next steps** to make this real?

Current State Challenges for Sheep Disease Traceability

There are number of challenges for how data is currently being captured and shared across the value chain

Challenges

Limited Access to Digital Data

Data needed for disease traceability is often being captured in physical paper format; in the event of an outbreak, this can slow down the speed of trace back efforts as inspectors are forced to visit sites in-person.

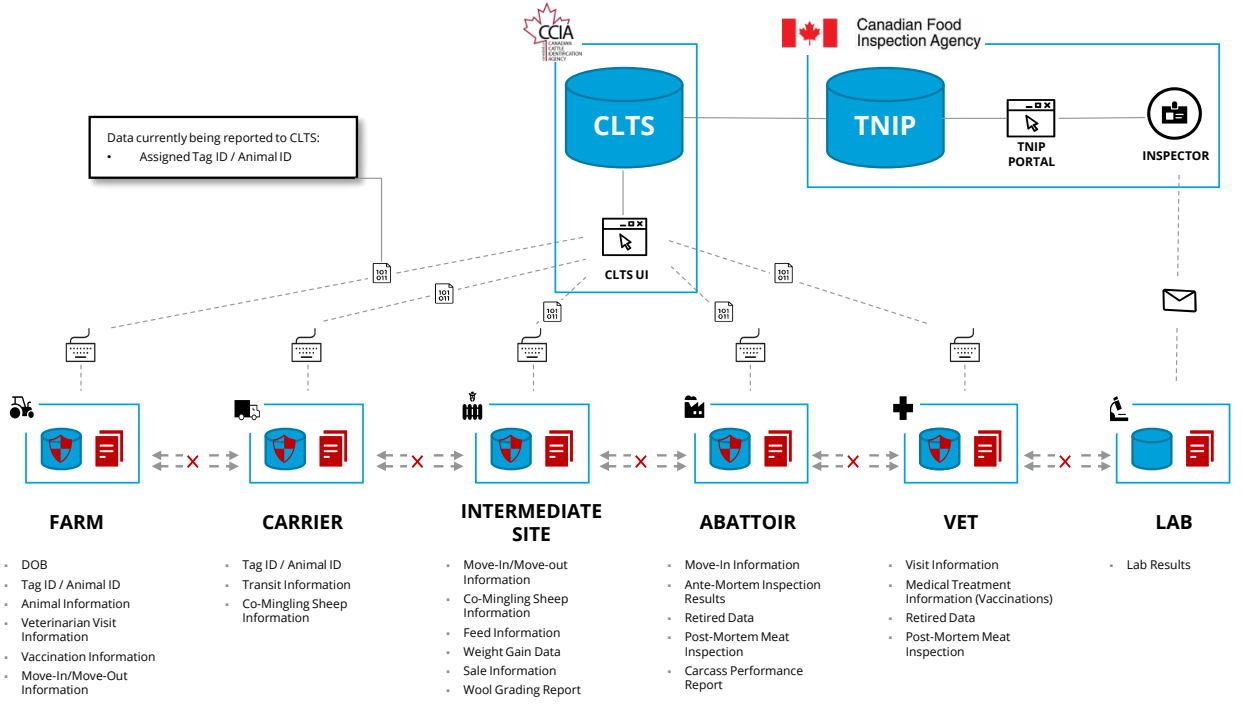
Lack of Interoperability Across Industry

There is lack of system interoperability before and after slaughter; this results in added difficulties when there is a disease outbreak and trace information is needed for an animal both ante- and post-mortem.

Trust and Privacy Concerns

Livestock operators have trust and privacy concerns when sharing information about their operations with other livestock operators and the government. There is a need for them to have control over who is accessing their information and what they are using it for.

High Level Current State Architecture



What is Blockchain

At its core it's a **Ledger**

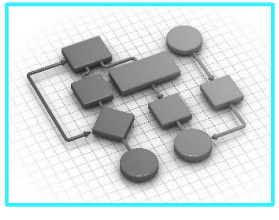
- Double entry – when transferring value
- Single entry – when recording a fact

It's **Distributed**

- No single owner
- No single point of failure

It's based on **Cryptography**

- This provides the immutability
- Allows transactions to be trusted by the network
- Ensures it's tamper proof



It is super-charged through **Smart Contracts**

- Provides business logic to control or execute transactions automatically
- The smart contracts enable mechanisms to define the rules of the engagement between ecosystem partners

What this means to the Sheep Value Chain

- **End-to-end animal traceability** (including interoperability with GS1 through an intermediary "bridge" data standard)
- **One-and-done Data Entry** for livestock operators across the chain
- **Enhanced Data Integrity** for CFIA Inspections
- **Automation opportunities** for transactions between ecosystem partners
- **Certificate management** & enhanced compliance verification

When is Blockchain an Effective Solution

There are several requirements that when met (**in part or in full**) indicate that blockchain may be a good possible solution.

Shared / Transfer of Data

Blockchain is a technology for **shared databases** – there is a need for a structured repository of information

Opportunity for Disintermediation

Blockchain removes the need for **trusted intermediaries** – no gatekeeper is required to verify transactions and authenticate the source

Multiple Writers

Blockchain is a technology for **databases with multiple writers** – multiple entities generating transactions that modify the database

Absence of Trust

Blockchain is a technology for multiple **non-trusting writers** – there needs to be a lack of trust between the entities writing to the database

Transaction Dependency

Blockchain provides value when there is **interaction** between the transactions created by the writers – the transactions depend on one another

Why Blockchain Versus a Traditional Database

Blockchain enables a number of key features that traditional databases do not

Feature	Blockchain	Traditional Database
Security/permissioned access to data	Secure permissioned access to data	Multiple points of security failure
Auditability	Data is auditable	Data is auditable
Tamper-proof	Inherently tamper-proof	Can be accessed/tampered by database administrators
Integration with existing systems	Can integrate with existing systems	Can integrate with existing systems
Simplified access for ecosystem partners	Easy access to a public network for data sharing with other ecosystem partners	Difficulty in adding ecosystem partners (other OGDs)
Adding additional ecosystem partners	On-boarding additional partners is relatively simple; no large system integration is required	On-boarding additional partners is costly
Data ownership	No data/database “ownership” as blockchain is a distributed ledger	Complexities with data ownership across multiple systems

How Blockchain Can Enhance Sheep Disease Traceability

There is overlap between the key characteristics of using blockchain and the current state challenges in sheep disease traceability in Canada

Increased Interoperability Across Sheep Value Chain

A distributed, decentralized system in place would help mitigate issues related to lack of system interoperability throughout the Canadian sheep value chain.

End-to-end Traceability for Value Chain

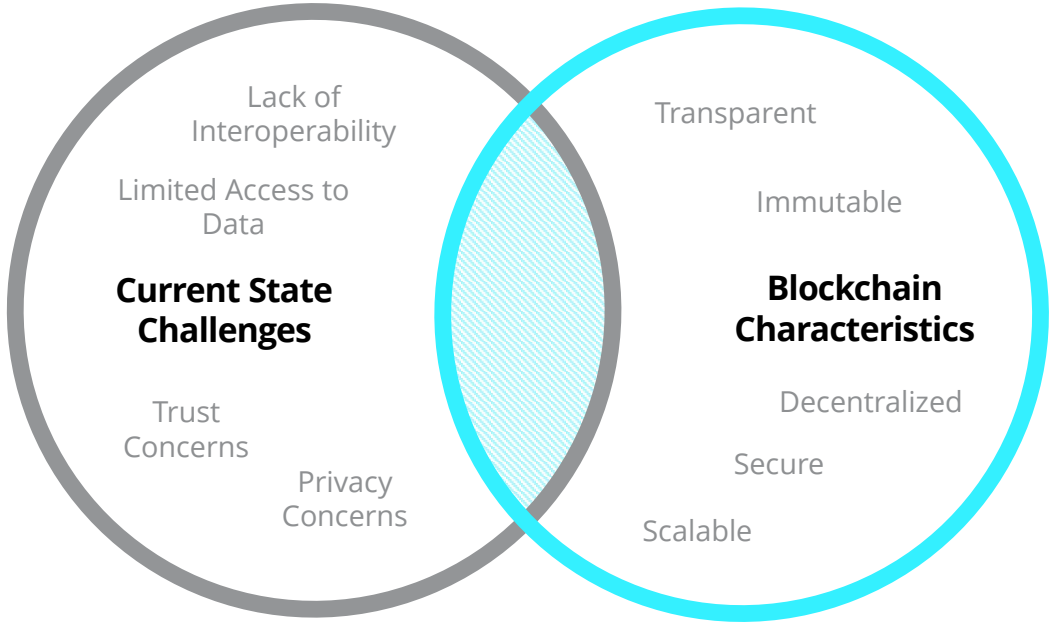
With key partners included in the blockchain ecosystem, regulators would gain access to data from end-to-end of the value chain.

Verifiable & Immutable Data

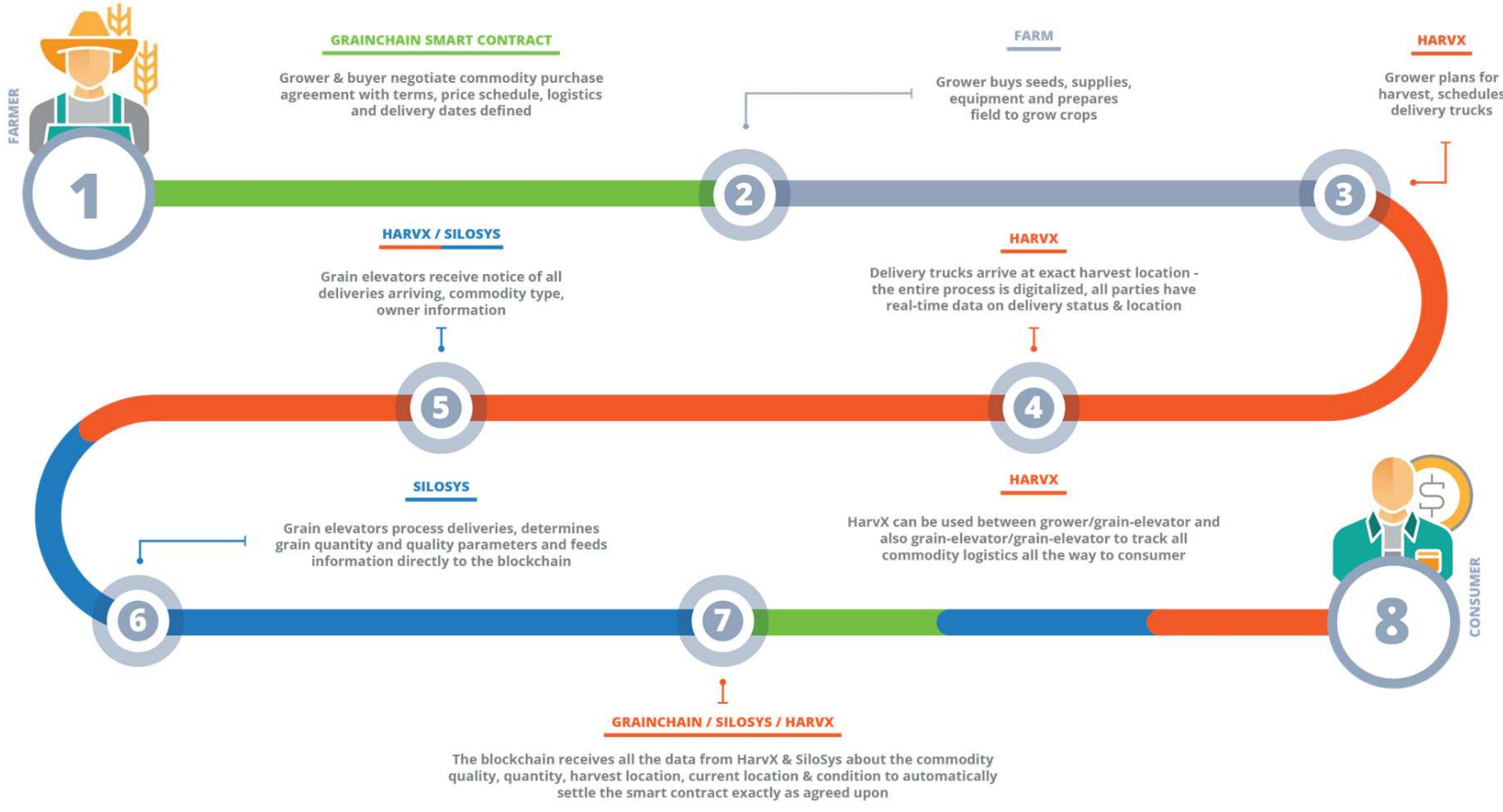
Although it does not solve the issue of paper-based record keeping, blockchain would enable access to verifiable and immutable data as the industry continues to adopts digital record keeping practices.

Dynamic Permissioning & User Control of Data

Blockchain's ability to dynamically control permission and access to data would allow regulated parties in the value chain better control over who can access their sheep data and how long they can access it for.



HOW IT LOOKS LIKE IN ACTUAL USE



HarvX

Logistics Management for the Entire Agri-Supply Chain: Field, Transportation, Elevator, and Beyond.

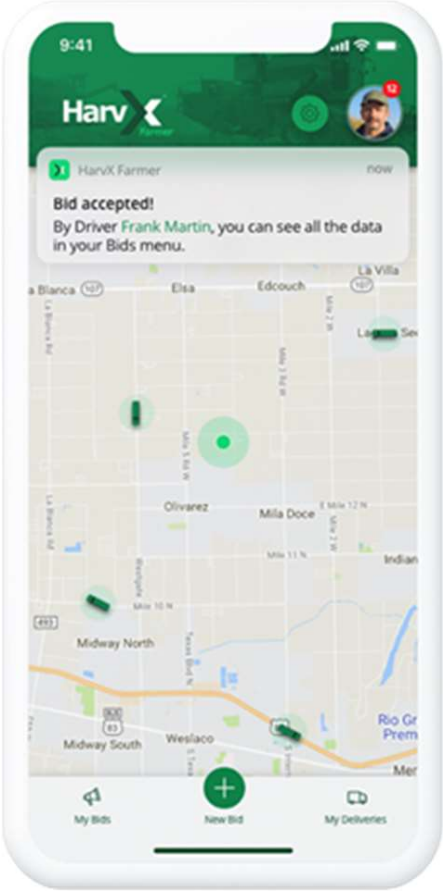
OUR MISSION

To enhance global commodity logistics by connecting clients directly with delivery drivers, automating workflows and capturing reliable tracking information.

- Digitizing business processes.
- Producing reliable data.
- Reducing human error.

Benefits to Farmer

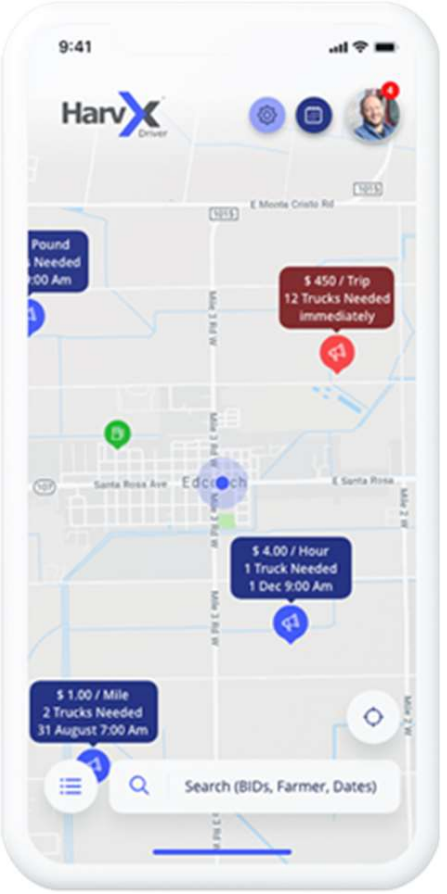
- Direct access to Truckers
- Real time logistics information
- More efficient farming operation
- Full compatibility with GrainChain platform

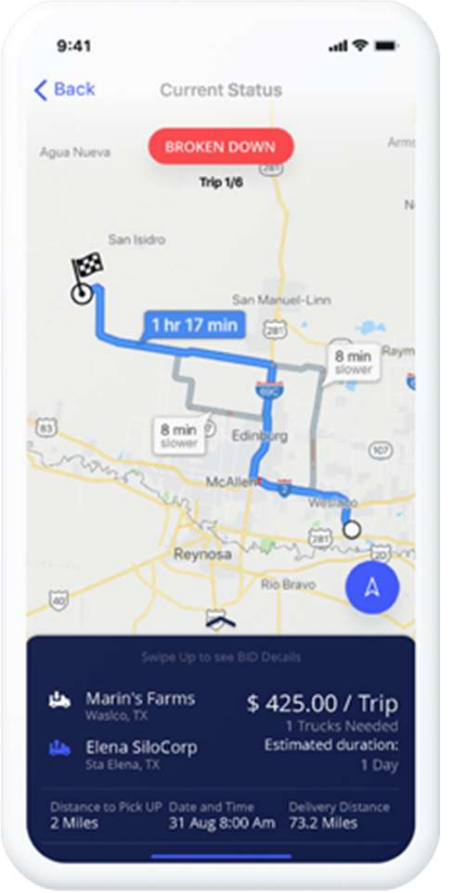


HarvX Driver

Benefits to Drivers

- Faster payment
- Fully manage business operation in mobile app from the road
- Direct access to Farmers, full compatibility with GrainChain platform
- Find more trips via BID System

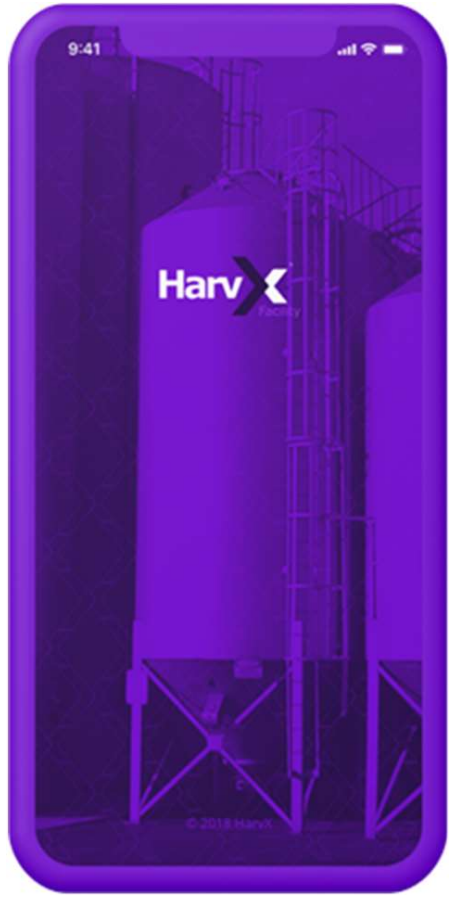


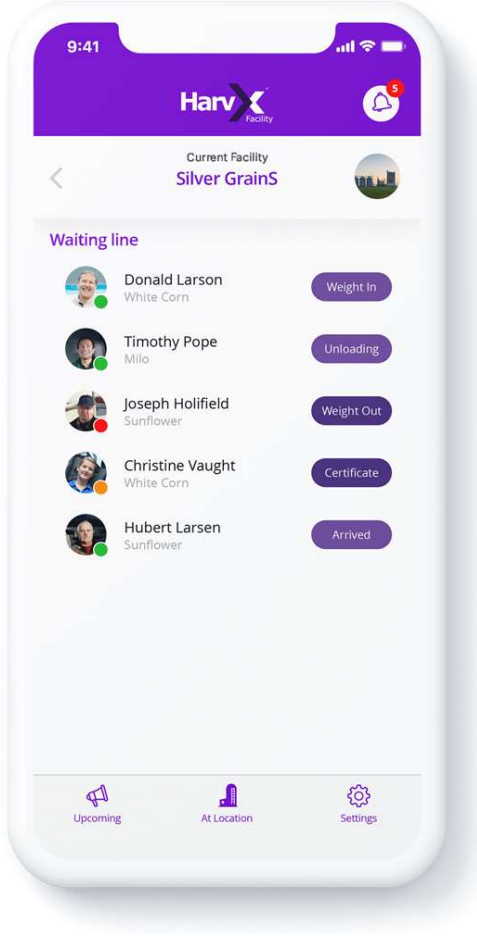


HarvX Facility

Benefits to Facilities

- Greater efficiency in operation
- Greater accountability
- More inventory control
- Full compatibility with GrainChain platform
- Adhoc route redirection for efficient logistics management





BLOCKCHAIN ENABLED TRANSACTION PLATFORM

OUR BLOCKCHAIN-ENABLED PLATFORM IS DRIVEN BY SMART CONTRACTS WHICH BRING THE MOST TRUSTED, EFFICIENT AND RELIABLE TECHNOLOGY TO GLOBAL AGRI-SUPPLY CHAINS.

OUR MISSION

To facilitate transactions, increase trust and empower participants in domestic & global commodities trading using a central blockchain enabled software platform.

- Reducing middlemen.
- Increasing transaction reliability.
- Increasing traceability.
- Increasing international trade.

GrainChain EcoSystem

GrainChain Integrators

Offering a new set of features to their current customers, integrating a robust payment system.

Elevator (SILO) Operators

Web and app based real time inventory tracking across multiple locations.
Fast payment for in/out, storage & management for grain.

Farmers

Immediate payment upon delivery and quality verification.
Increased customer base due to secure funded transactions.

Buyers

Smart contract guarantees availability and quality of purchase.
Expanded customer base.

Consumers

Traceable from seed to mouth with IoT data input giving ultimate data transparency on the Blockchain.

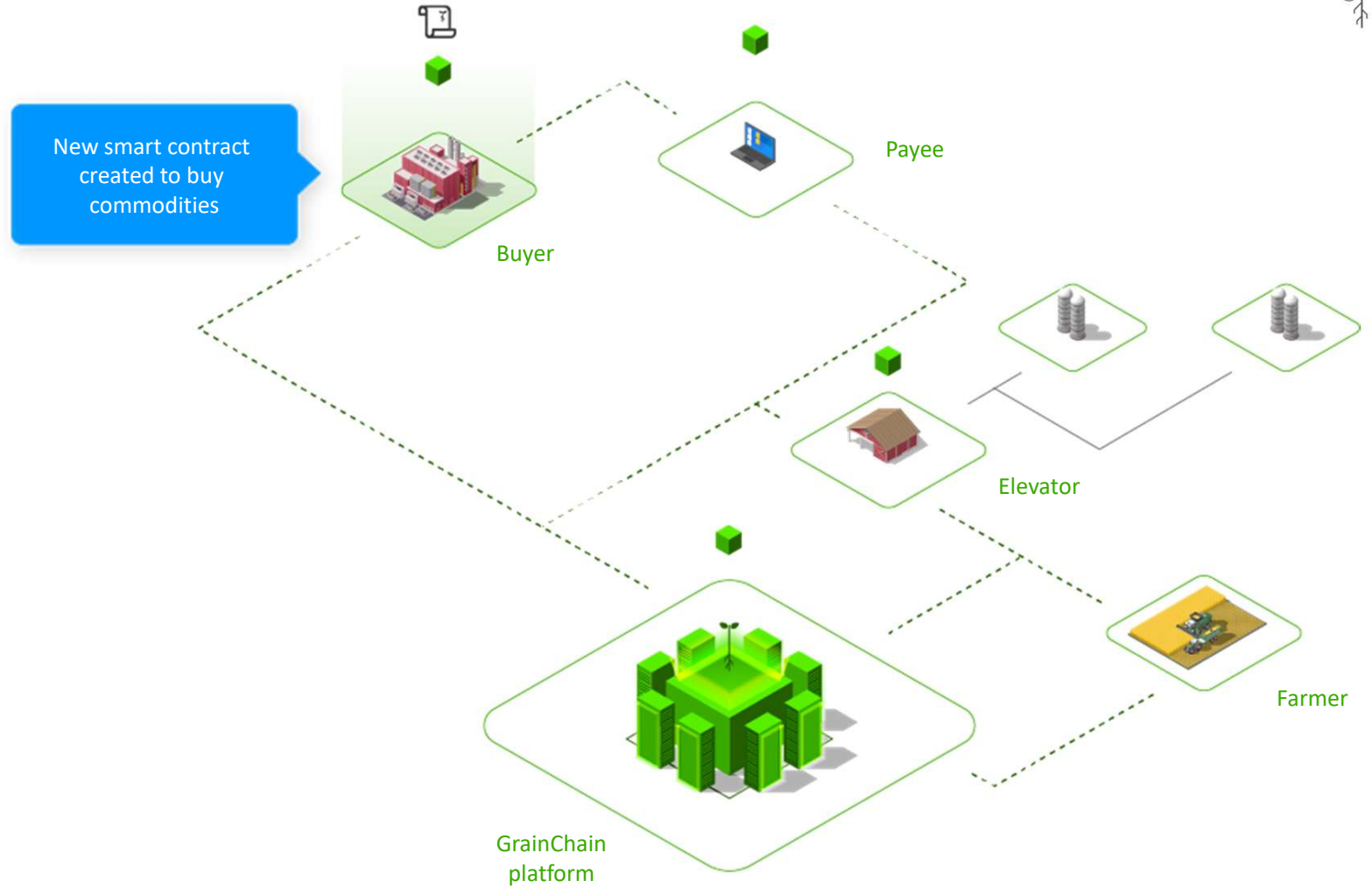
Insurance & Regulators

Participants have the option of generating efficient and reliable real time reports for insurance and regulators directly from the blockchain.

Smart Contract Example

Buyer Smart Contract

Smart Contract Flow Example

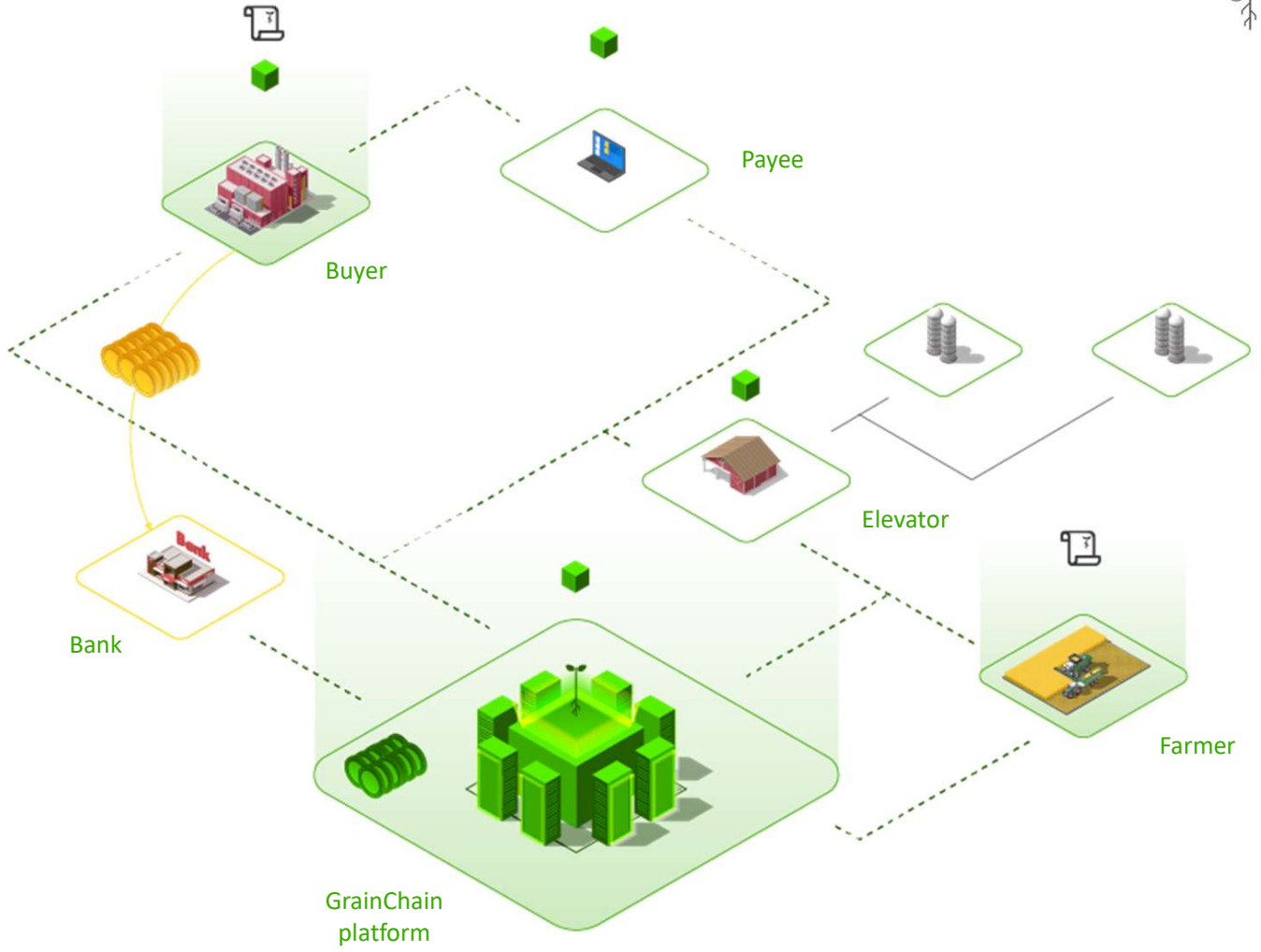


Buyer Smart Contract

Smart Contract Flow Example

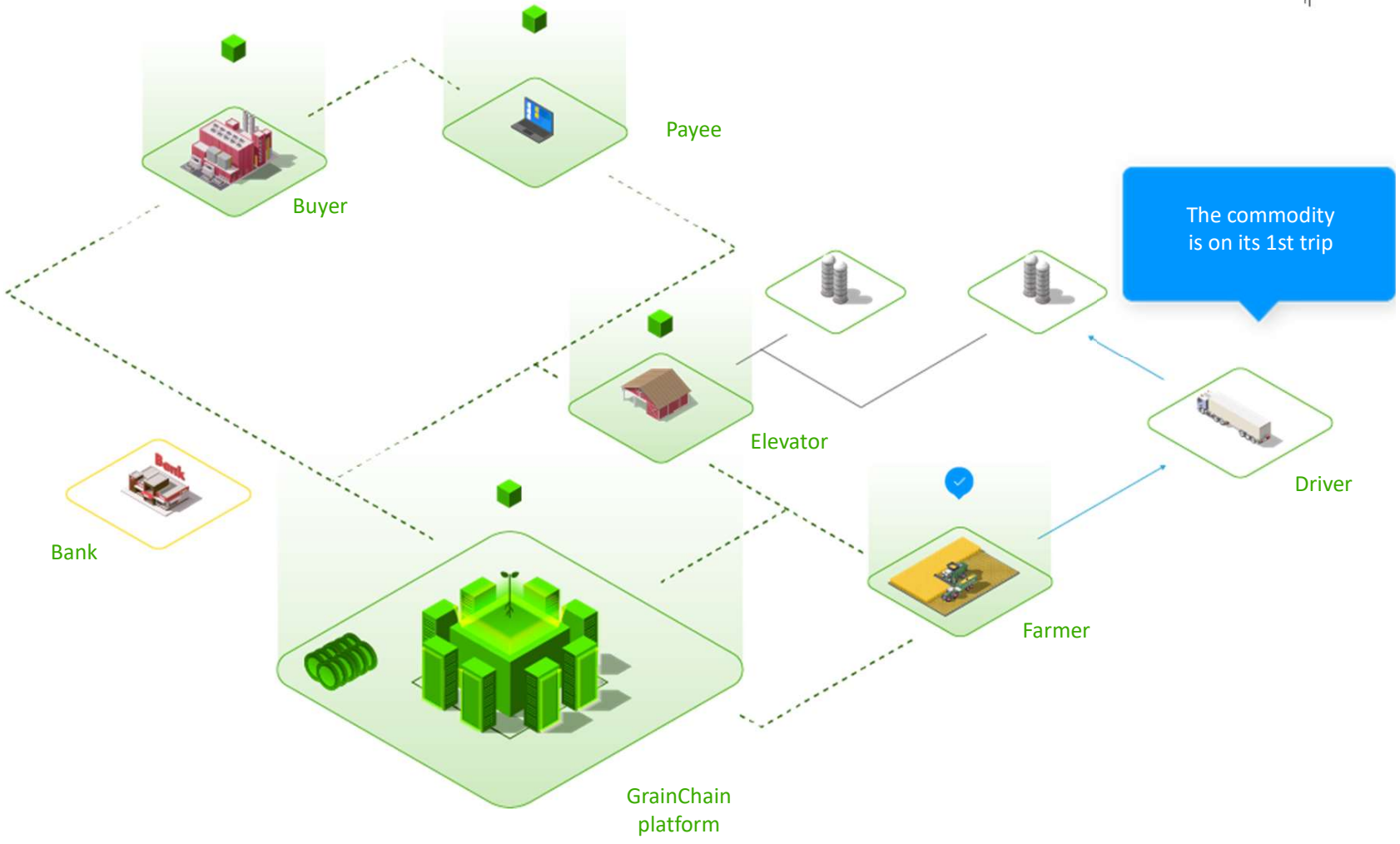
The smart contract is negotiated & accepted by the farmer

These contracts can be multivariable & multipayee, in this example an elevator, payee and logistics have been added into the contract along with the multiple DROPOFF points.



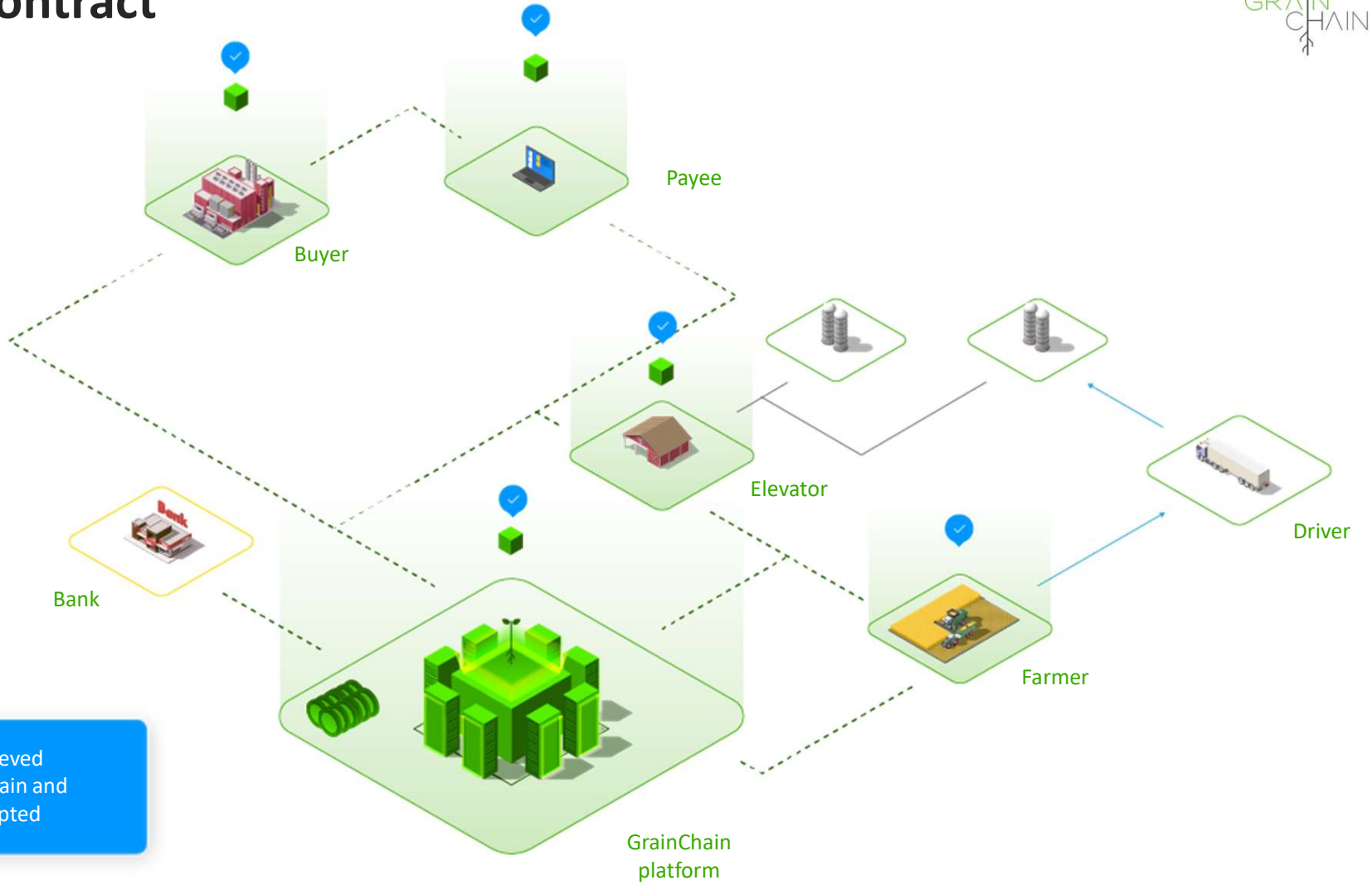
Buyer Smart Contract

Smart Contract Flow Example



Buyer Smart Contract

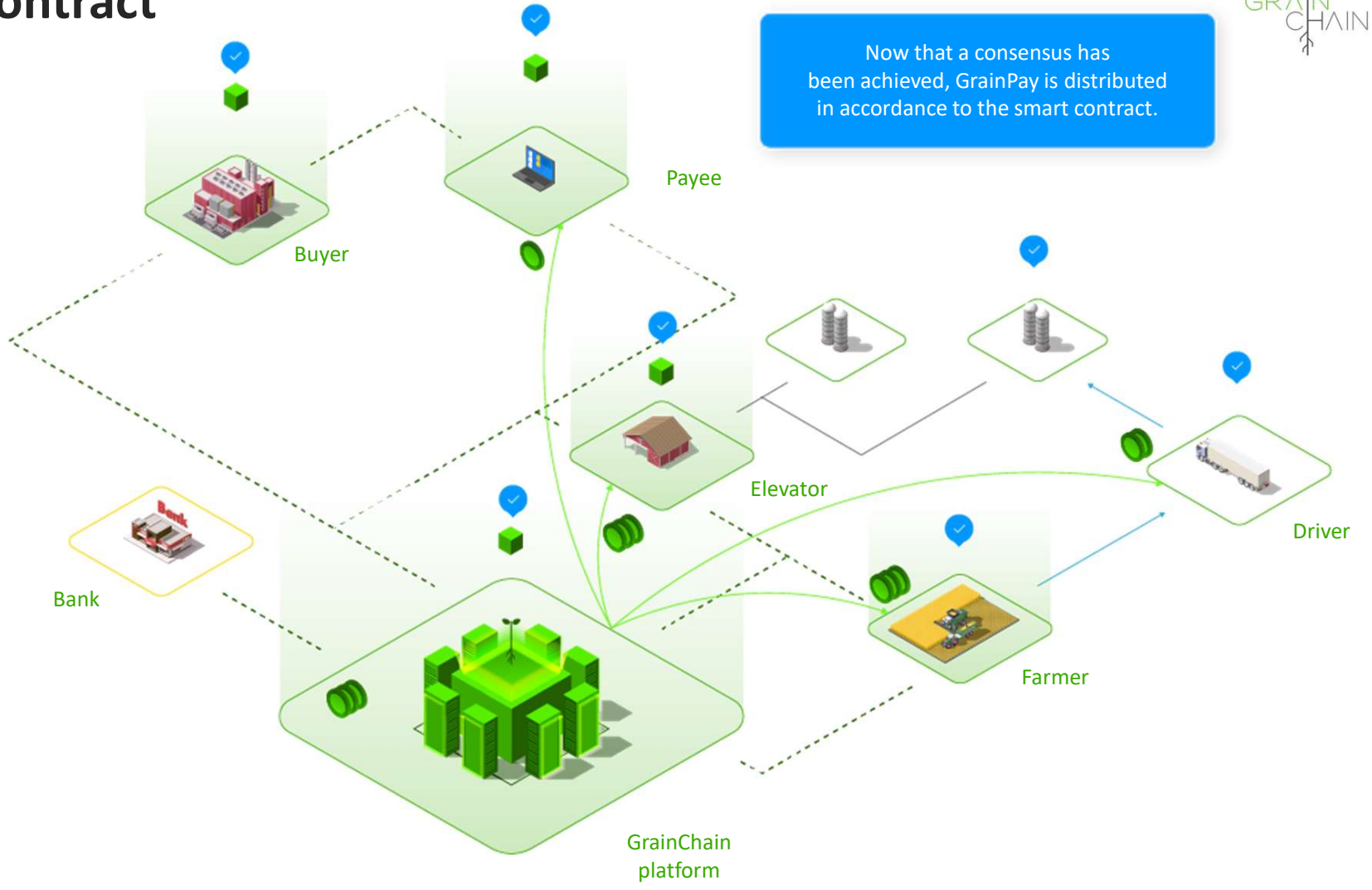
Smart Contract Flow Example



All the peer nodes achieved consensus on the blockchain and the 1st delivery is accepted

Buyer Smart Contract

Smart Contract Flow Example



Buyer Smart Contract

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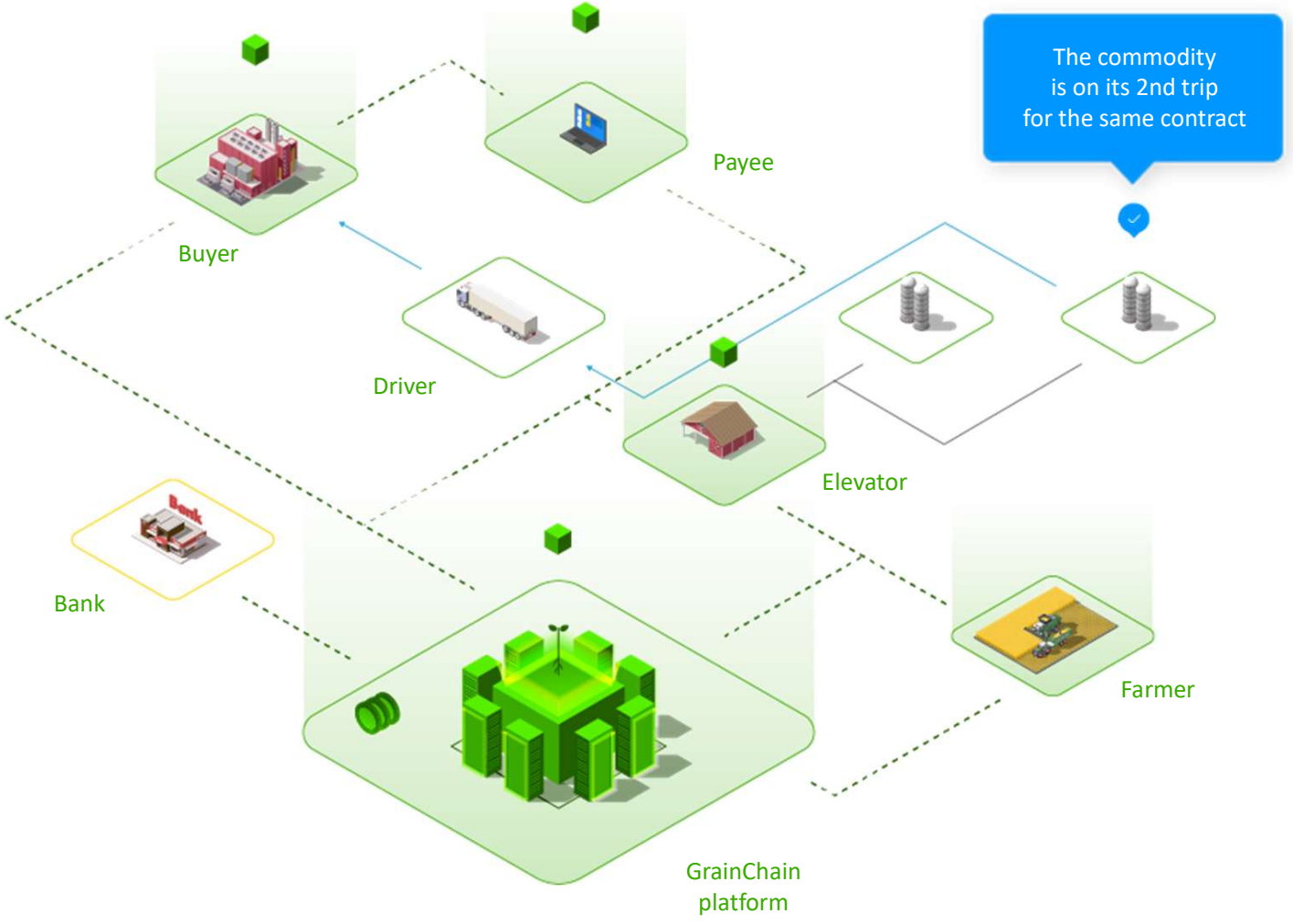
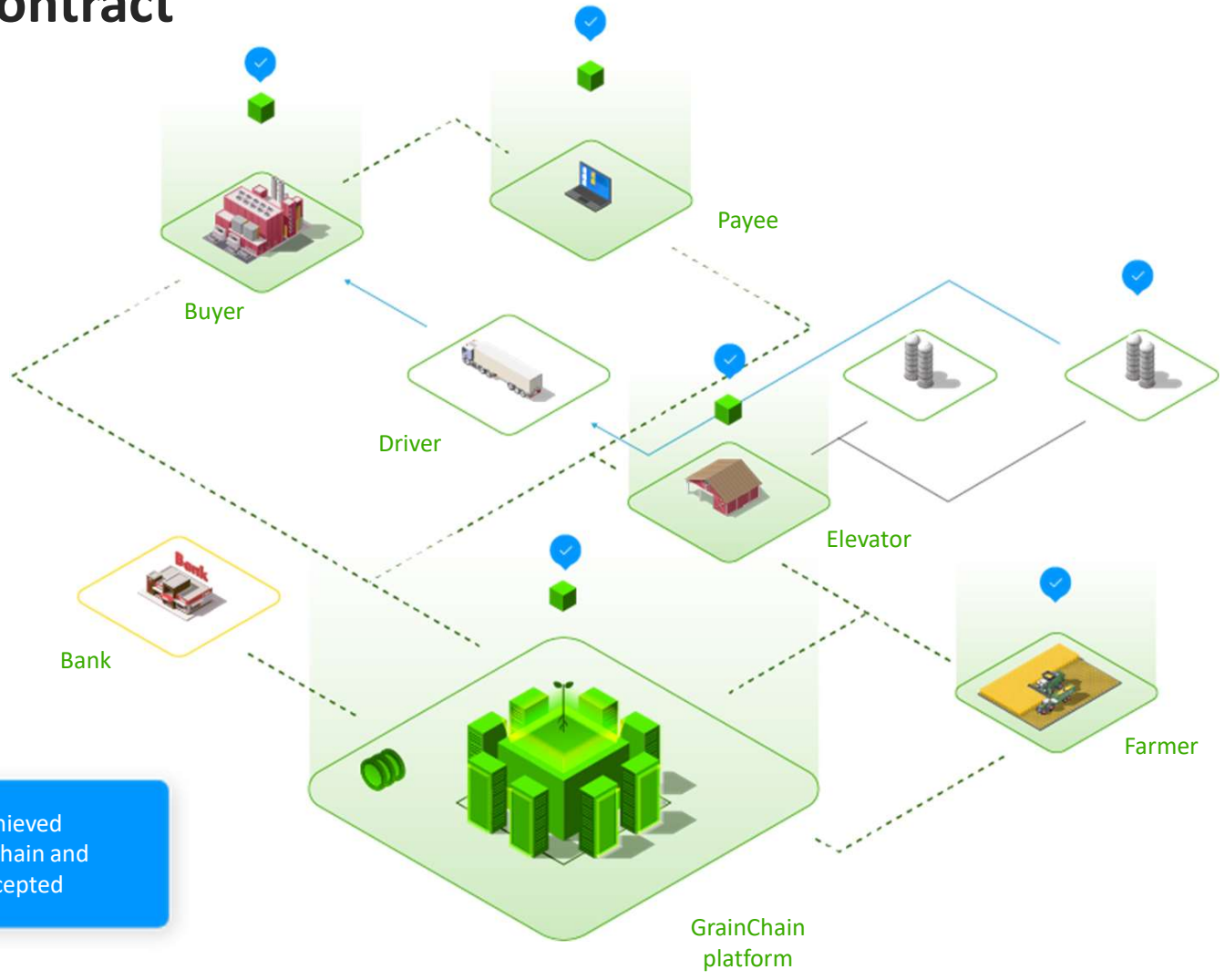


Buyer Smart Contract

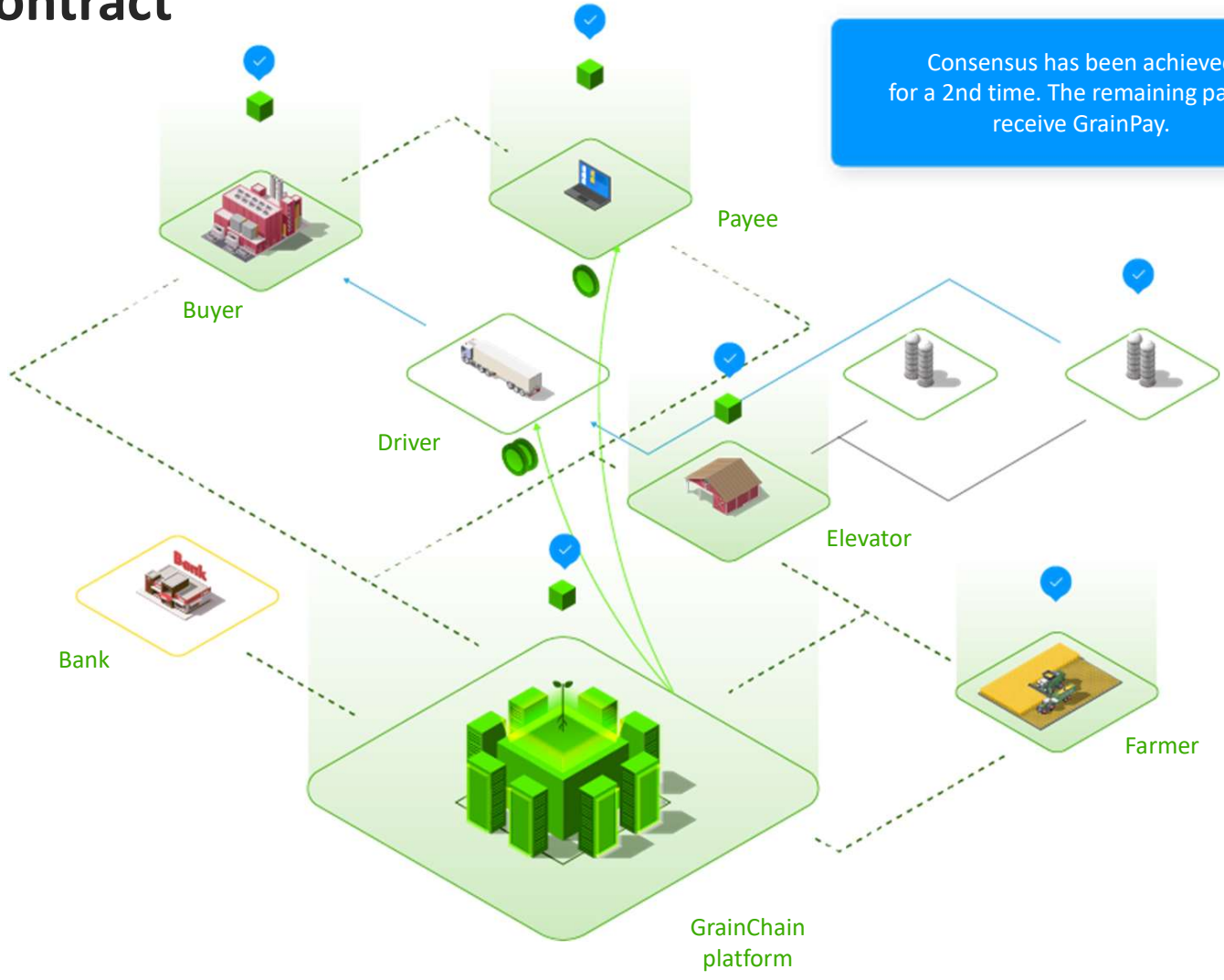
Smart Contract Flow Example



All the peer nodes achieved consensus on the blockchain and the 2nd delivery is accepted

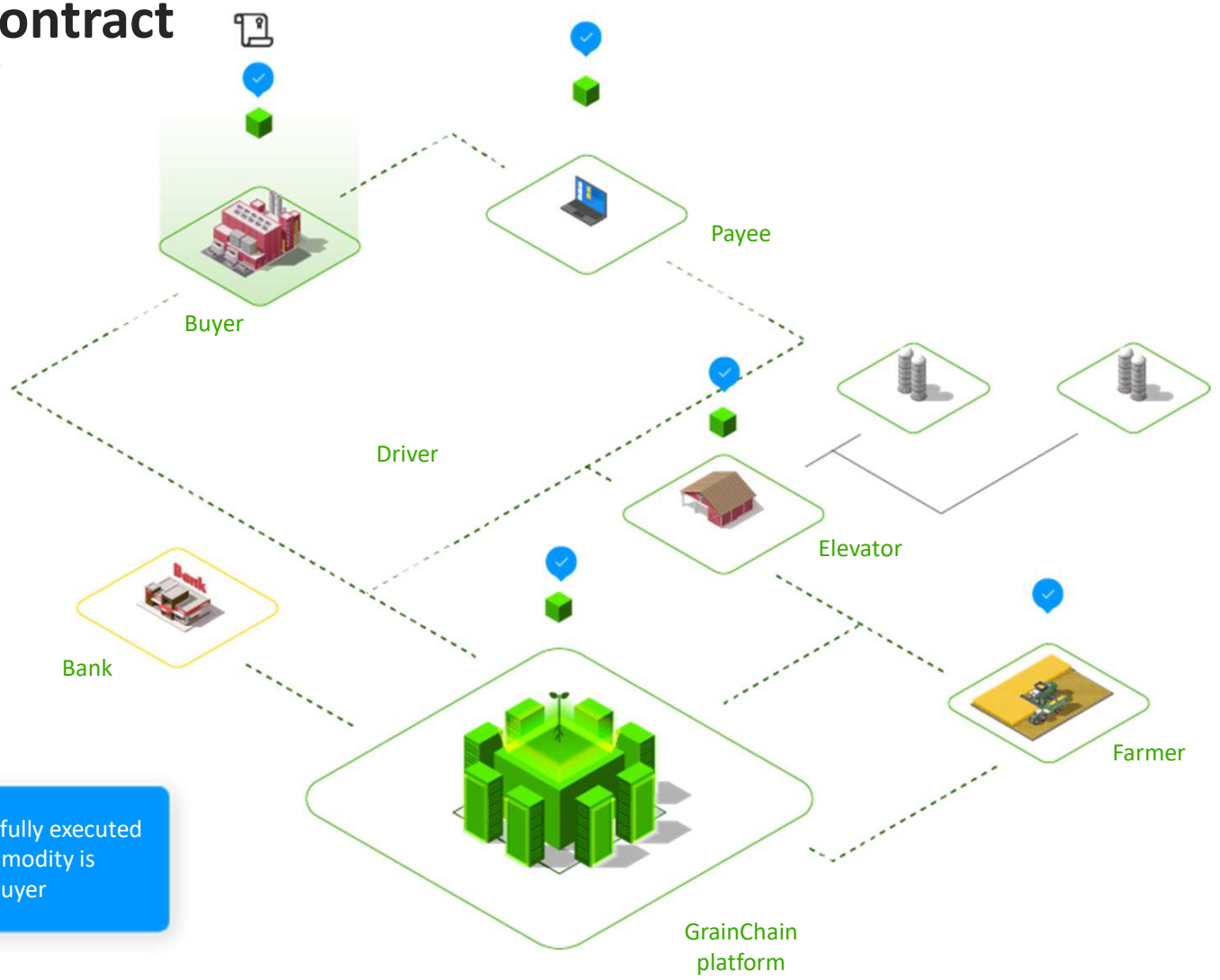
Buyer Smart Contract

Smart Contract Flow Example



Buyer Smart Contract

Smart Contract Flow Example



The smart contract has been fully executed and now title of the commodity is Transferred to the buyer

Buyer Smart Contract

Smart Contract Flow Example

GrainChain participants may convert or auto-convert their GrainPay to fiat currency at any point of ownership