

Blockchain Technology: What Is It?

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Key Points

- Blockchain has potential to improve traceability and accountability across the feed supply chain
- Blockchain allows parties to trade in the absence of a mediator or trusting relationship
- Blockchain transactions are decentralized, immutable, consensus-validated, and secured

The US swine industry is under intense pressure as African Swine Fever impacts more countries. The ability to prevent its introduction into the US becomes more difficult due to the global nature of food and feed supply chains and trade. A University of Minnesota report highlighted the significant trade volume and number of swine feed ingredients (animal-based, plant-based and other synthetic and naturally occurring trace ingredients) being imported into the US (CAHFS, 2015). Frequent and high-volume trade of ingredients carries an inherent risk for transmission of foreign animal viruses (Dee, 2016). The risk of foreign animal viruses entering and spreading within the U.S. via feed increases with several factors. These include ingredients sourced from countries or areas known to be endemic or with history of previous outbreaks of foreign animal diseases, the likelihood of virus introduction into the feed ingredient supply chain, the ability of viruses to survive in the ingredients for extended periods, and the ingredient volume imported or transported. As a result, a variety of interventions and technologies are being discussed as opportunities to enhance feed biosecurity. These include the application of blockchain to improve traceability and accountability across the feed supply chain.

The power of utilizing blockchain technology in feed supply chain transactions is in allowing parties to trade in the absence of a mediator or trusting relationship. This is the cornerstone of all blockchain applications - secure trading of 'things', both physical and virtual, without middlemen and historical relationships. Blockchain technology is fundamentally about a mutually shared network (Wong, 2018). It is a comprehensive technical system that integrates various practices including consensus mechanisms, encryption algorithms, smart contracts, and distributed data storage (Wu & Tran, 2018). This allows any transaction recorded in a blockchain to be:

Decentralized – a distributed network structure with no privilege for any one of the nodes. The larger the number of nodes to validate the transaction, the smaller the risk of the transaction becomes (Figure 1).

Immutable – once a transaction is confirmed and added to the chain, it becomes virtually impossible to change and, thus, also becomes resilient to tampering.

Consensus validated – each transaction is agreed upon by all stakeholders (Figure 2).

Secured – cryptography secures records on a blockchain.

As a result, the core of blockchain allows for the complete transfer path of an object to be fully recorded and traced (Wu & Tran

Within the food and agriculture space, blockchain is the rising star in food traceability. Most of the current platforms being promoted, operate as a consortium under the leadership of a group of stakeholders. Industry leading companies are actively seeking organizational collaborations to support the development of blockchain platforms and tools for a variety of food and feed applications. For example, IBM is one of the earliest multinational blockchain initiators in the food and agriculture sector and has been actively promoting the development of blockchain technology and applications. They have been cooperating with some of the largest food and retail brands through the [IBM Food Trust](#) and the international trade and shipping industry through [TradeLens](#).

The Food Trust utilizes blockchain technology to provide visibility and accountability across the food system to address issues like food safety, supply chain efficiency, food waste, and sustainability (Gelski, 2018). TradeLens, a platform created by IBM and Maersk and comprised of an ecosystem with over 100 organizations, benefits the industry through the management of transactions among the network of shippers, freight forwarders, ocean carriers, ports, and customs authorities (MasContainer, 2018b). Traditionally, a simple intercontinental shipment of refrigerated goods can go through nearly 30 people and organizations including more than 200 different interactions and communications (IBM, 2017a). Use of blockchain and digitization of records associated with the trade documentation and administration are estimated to reduce actual transportation costs by 80 percent.

In addition to the large consortiums, many individual companies are implementing blockchain technology with their supply chains. These include:

Animal Protein Products

JD.com
TE-Food
Carrefour
Go Go Chicken
BeefChain
Kelly Products
Provenance
World Wildlife Fund

Other food Products

Walmart
Ripe.io
Olivacoin
Bext360

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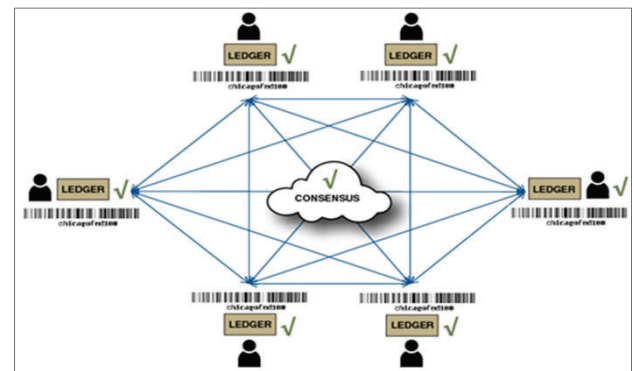
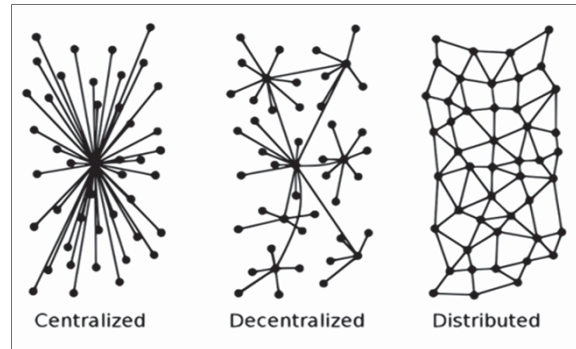


Figure 1 (Top): Centralized, decentralized, and distributed network structures (Crowe, 2016).
Figure 2 (Bottom): Consensus validation across all participants in the blockchain network

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