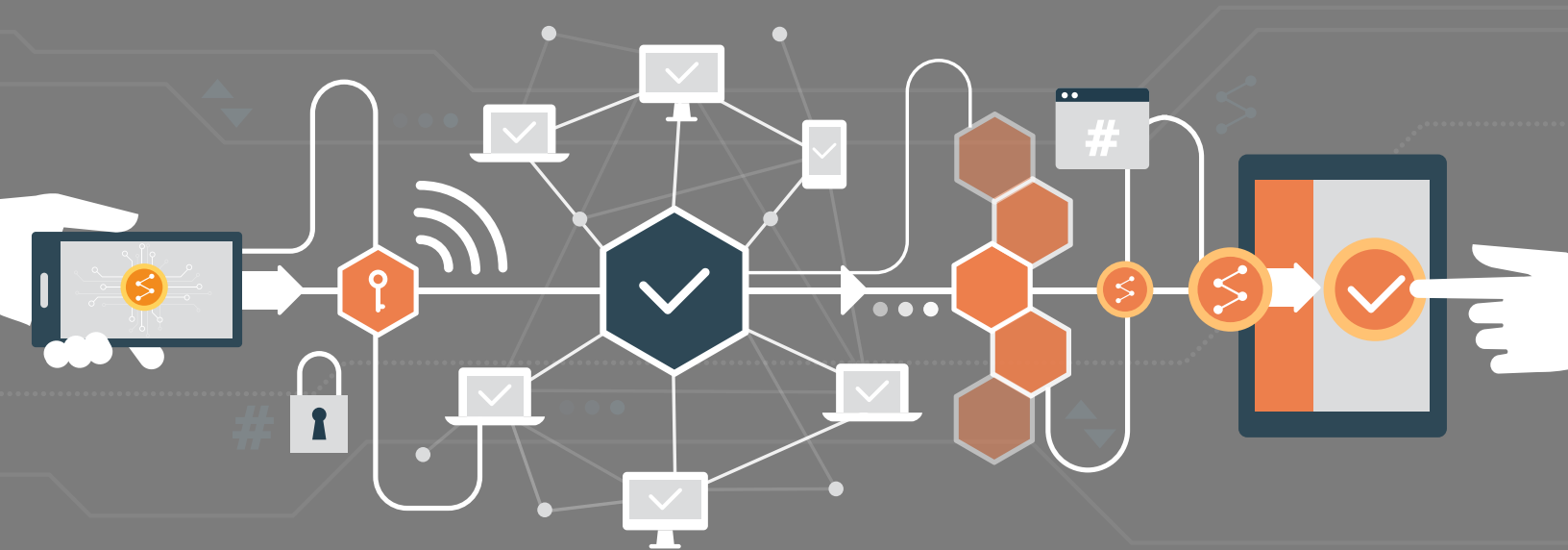
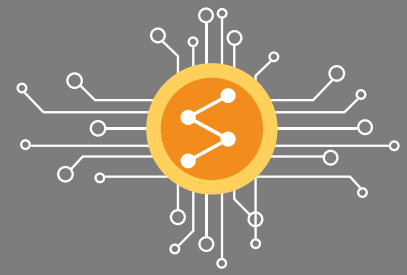


white paper

# DATA + TRANSPORTATION TECHNOLOGY



## TRUST NETWORKS AND TRUCK NETWORKS: BLOCKCHAIN IN TRANSPORTATION





Blockchain has already made an impact on various industries — it is poised to change or even replace the infrastructure of the financial services industry, and other industries like transportation can expect disruption as well. Blockchain technology, like many new technologies, can completely transform the way in which we conduct business. Blockchain technology has a number of benefits but an underlying component of it involves trust. Business transactions between two or more parties have already moved from paper to digital in many applications. By leveraging blockchain, an industry can enable secured, digitized transactions with approval granted mutually by participating parties, tracked in a common history, and requiring no central authority.

Blockchain can be an important next step for the Internet of Things (IoT), specifically in transportation telematics. Today, we're already seeing blockchain discussed in the transportation industry — primarily with agreements between shippers and carriers — but what does it all mean? We will discuss the future of blockchain in transportation, explaining the key benefits of the technology and how these *trust networks* can work with *truck networks*.

## Bitcoin and Cryptocurrencies

To start, a distinction should be made between blockchain and Bitcoin. Cryptocurrencies such as Bitcoin are often mentioned in the same conversations as blockchain. Bitcoin is probably the most common use of blockchain with which most people are familiar. Bitcoin is what you would refer to as a digital currency or cryptocurrency — there is no physical representation of this; it's simply a string of numbers that represents a token value. To keep track of the transactions, which are done entirely online, you need a new kind of secure, peer-to-peer network capability that provides privacy, integrity, and security for the transfer of a cryptocurrency like Bitcoin.

In a cryptocurrency transaction like Bitcoin, buyers and sellers use private keys to authorize a Bitcoin transfer between electronic wallets. Transactions are verified through a network of computers, with unique addresses created for every transaction.

Bitcoin is, essentially, a serial number on the blockchain, and the blockchain is a cryptographic, peer-to-peer network. It's one example of a distributed ledger.

What's a distributed ledger?

Most companies are familiar with a single ledger, where you make an update to your ledger for an account receivable or account payable. Single ledgers aren't updated immediately and payments are separate and uncoordinated. A distributed ledger, on the other hand, is synchronized across networks and allows for secure, identical copies of the ledger across parties with near real-time updates.

Cryptocurrencies present opportunities to take some of the impediments out of economic transactions. The financial industry has embraced blockchain and cryptocurrencies to resolve issues with wire transfers, especially when multiple currencies would normally be involved. Blockchain also helps financial institutions reduce fraud, enable secure payments, and improve multi-party transactions.

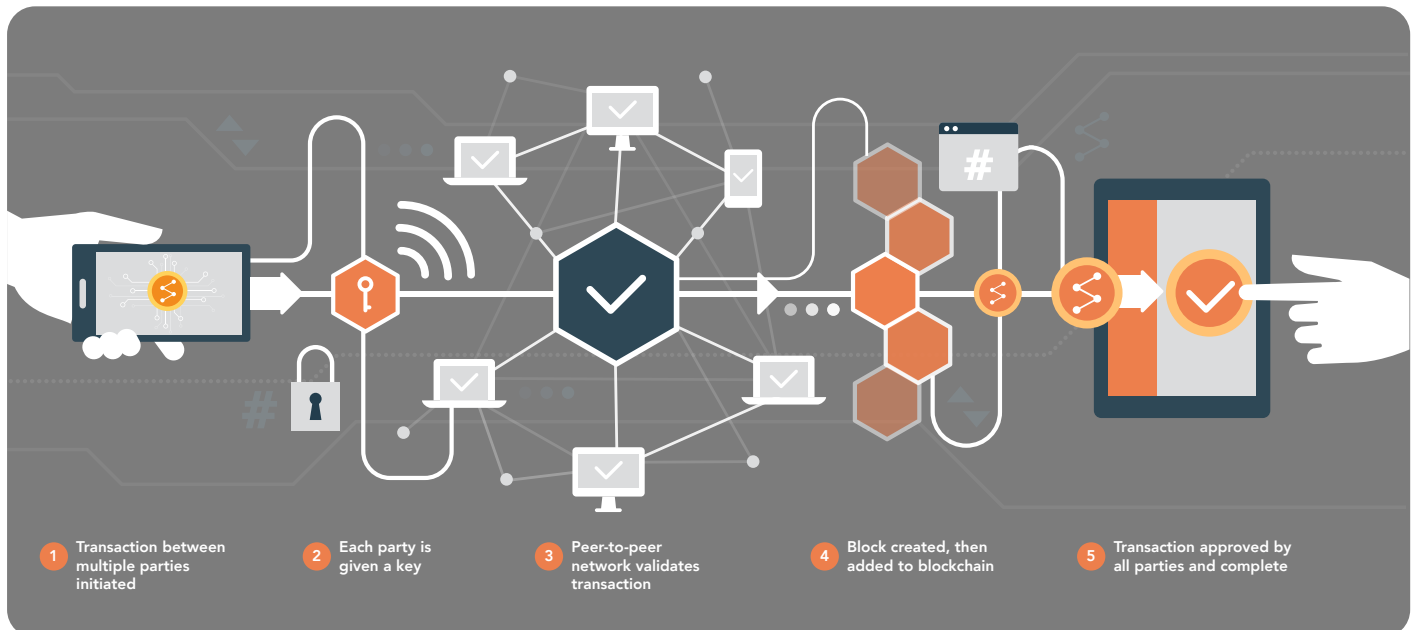


### How Blockchain Works

With blockchain, data is logged on a network and stored in blocks. As each transaction happens, it is added into a block with other validated transactions. These blocks are linked and secured by cryptography. The blocks are built together into a chain that cannot be altered.

Before new transactions, or blocks, are added, all parties involved need to arrive at a consensus. Industries utilizing blockchain see efficiencies with blockchain transactions because each person involved has a separate ledger and does not need to return to a central authority at each step.

Blockchain transactions can involve cryptocurrencies like Bitcoin, records, contracts, or other types of information.



### Understanding the Terminology

**Distributed Ledger** – Contains the blocks within the chain and the state data maintained by each of the ledger peers

**Smart Contracts** – Responsible for processing the transaction requests and determining if they are valid by executing the business logic

**Membership** – Authenticates, authorizes, and manages identities in a secure and permissioned network

**Peer-to-Peer Network** – Authenticates an underlying network relationship that facilitates the consensus and state of the distributed ledger

**Events** – Significant notifications, operations, and transactional changes that happened with the blockchain and smart contracts

**Consensus** – Agreement on valid state of transactions amongst the network of distributed ledgers

**Cryptography** – Underlying capability responsible for signing transactions and maintaining transaction visibility and links between blocks

**Wallet** – Authenticated and securely managed user credentials





## *Benefits of Blockchain and Distributed Ledgers*

Generally, blockchain distributed ledgers facilitate a number of use cases:



### **Improved tracking and historical record**

When you have a distributed ledger, and you're updating all the portions of that ledger almost simultaneously in a peer-to-peer network, you're getting a better tracking and historical record. Everyone who is a participant has an opportunity to see it, as well as add information to the record for the benefit of all.



### **Decentralized record sharing**

Decentralized record sharing has a lot of advantages because you can see the truth, somebody else can see the truth, and — being decentralized — it's potentially more robust. You don't necessarily have one data center going out, and everything disappearing.



### **Public or private shared agreements**

When we typically think about Bitcoin, one of the reasons it's been used in places like Venezuela is because they could use it as a hedge against their local currency, but they could still make private transactions to buy items in the U.S. and have them shipped to Venezuela. That's where you have more of a private exchange, but one powerful thing about distributed ledgers is the potential to have a very public set of agreements in a large public chain with a lot of participants.



### **Reduced counterparty resolution costs**

In the banking example, there is always something in place that ends up slowing the payments or causing a resolution problem that forces multiple parties to get involved. This takes time and money — and potentially lawyers. When everyone has access to the immutable history of common records, it's easier to sort things out with fewer resolution costs.



### **Risk reduction**

With the decentralized ledger, it's easier to come to a consistent agreement, and there's more robustness to the overall process.



### *Applications of Blockchain in Transportation*

Knowing the foundations of blockchain and the general use cases, there are a number of potential applications for the transportation industry.



#### **Secure transactions and communication**

With cryptocurrency, like Bitcoin, there is an ability to secure transactions and communication. If you think about the potential for automated vehicles, you will want to be able to issue instructions in a way that you are not opening yourself up to any intervention that could potentially modify something about the vehicle. Or, if you're doing over-the-air updates, you don't want to open yourself up to anything that might change the individual components.



#### **Payments and pricing transparency**

Organizations that provide data intelligence and financial products in transportation could see payments and pricing transparency with blockchain. Blockchain would allow for visibility into all historical transactions and the ability to see what pricing has been. This enables both parties to have a better sense of what the real value of a haul is — and that improves the marketplace.



#### **Trusted partner visibility**

Relationships are part of conducting business and so is trust, whether implicit or explicit. Sometimes, there are counterparties used to fulfill obligations and that fact is not always widely known. Using blockchain allows businesses to see all parties, even if other partners are involved. There is better visibility into the entire process.



#### **Cargo theft and fuel fraud detection**

If you think about the inability to track something, or know where a truck is when a service transaction occurs, there is implicit potential around cargo and fuel fraud. Telematics providers can help facilitate locations. Some fuel providers can be sure that if a truck is in a certain location where it is scheduled to be fueled up, there is only one transaction occurring. Fuel fraud is just one of many examples.



#### **Autonomous vehicles and truck maintenance**

There is a significant cost in doing maintenance for vehicles. That cost will not go down with autonomous vehicles, and it's becoming more important to have records about what's being done to the vehicles and who did the work. Blockchain can help with those records.



#### **ELD compliance tracking**

The ELD Mandate is the talk of the trucking industry right now, and there is increasing interest in understanding Hours of Service compliance — whether dealing with an unknown operator or a third party. Partners will want reassurance that drivers comply with Hours of Service before getting loads. Blockchain could facilitate some of those reassurances.



#### **Pharma and cold chain custody**

There is a tremendous amount of rigor applied to the pharma and cold chain custody. Both the pharma world and the cold chain world are currently undergoing regulation changes. When dealing with regulated environments, it is important to see what opportunities for improvement exist. The example below illustrates blockchain in cold chain in more detail.



#### **Smart transportation contracts**

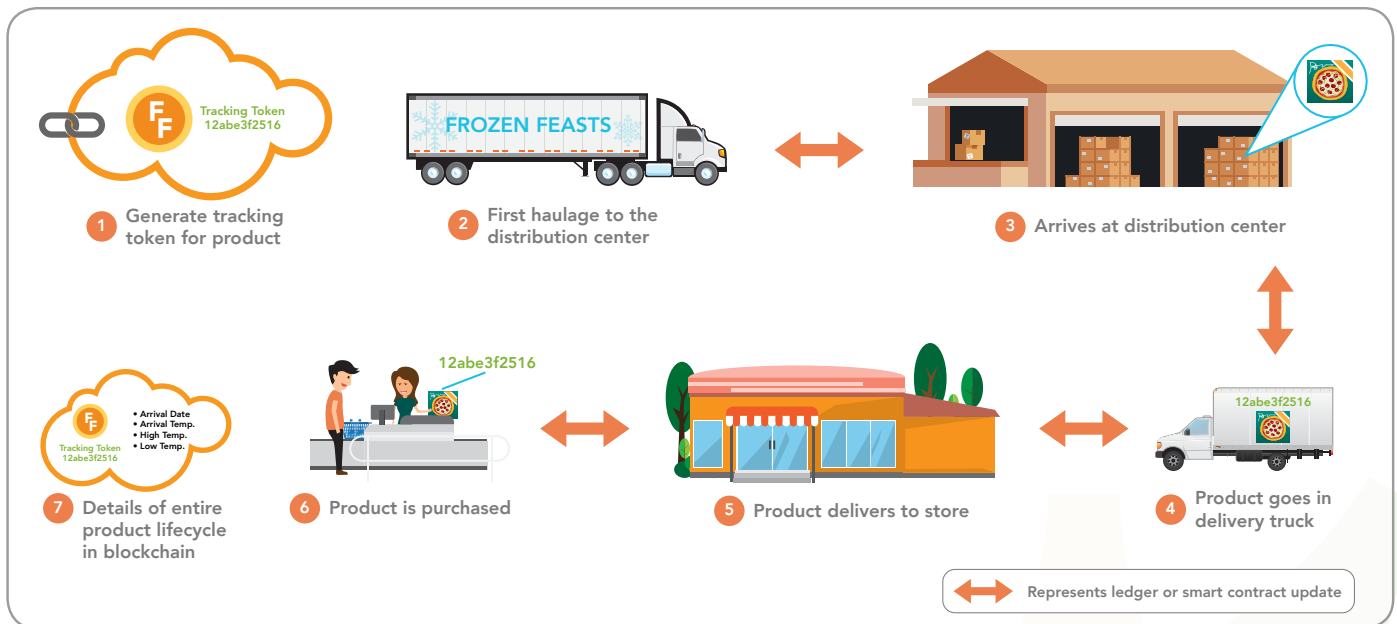
Once an order is fulfilled, a distributed ledger can be used to make an acknowledgement and even shift funds between parties.



### Blockchain in a Custody Chain Transaction

To show how blockchain works in a custody chain transaction, here is an example with a frozen foods company we will call Frozen Feasts. For this example, we will assume that Frozen Feasts elected to create a blockchain tracking process and that the process was public and available to all trucking firms.

The following illustration shows the steps the company would go through when using blockchain or distributed ledger in a custody chain. The arrows note smart contracts. At these points, significant notifications, operations, and transactional changes occur. They are captured throughout the network in the frozen product's life cycle all the way to the family who purchases it.



To start, Frozen Feasts creates a tracking token. This is just a number in a peer-to-peer network that has been created by the blockchain. This unique identifier is associated with one of the food items that is produced by Frozen Feasts. That association will exist throughout the entire lifecycle, so it can be filed through the cold chain.

The next step is the first haul to the distribution center. During this trip, pertinent information about the state of the product can be sent to the blockchain using various technologies (mobile, telematics, sensors, etc.). In this instance, the trailer belongs to Frozen Feasts but the truck belongs to another carriage firm. Frozen Feasts would be interested in knowing how their cargo was handled, the temperature of their product, and vehicle location data. All of that information could be kept in the blockchain and updated on a regular basis so the entire trip could be followed.

When the truck gets to the distribution center, there is another handoff. Here, the distribution center could validate that the product information (represented digitally by the tracking token) originated from Frozen Feasts and met any pre-defined criteria (i.e. product stayed below a certain temperature during transit, etc.). A transfer of the goods between the fleet and the distribution center would generate a new transaction to be added to the blockchain indicating ownership transfer. A smart contract could be automatically executed to facilitate the payment and transfer of the goods between respective parties.

From the distribution center, the product needs to get to a local store. At the store, a family comes in and purchases the product. We still have the tracking number, or tracking token, with all of the historical information associated with the product.

One might question why all of this is necessary when products already exist with barcodes. An instance where a barcode would not be sufficient is if the original set of servers at Frozen Feasts' plant were destroyed. In that case, all the information that was originally captured at the frozen foods company would now be gone. Because distributed ledgers and blockchain are on a peer-to-peer network and there are multiple players supporting that network, the information still exists in the blockchain in other ledger locations (not necessarily just associated with the same company). You can think about it as if someone saved something to the cloud, rather than only keeping local copies of documents and files.



## *In Conclusion*

Blockchain technology, while still somewhat new, has the potential to radically change the way companies conduct business in the near future. The financial industry is leading the way and soon trucking and transportation companies could enhance transparency and efficiency using similar principles. All business transactions involve some level of trust and consensus — and blockchain technology can facilitate trust and visibility between multiple parties. Several potential use cases of blockchain technology in trucking were outlined in this paper, but once this technology is widely adopted, the possibilities are endless.

## *About the Authors*

Omnitracs' Data and Analytics Team is a mix of data scientists, computer scientists, and business analysts in offices across the U.S. They all share a love of data, whether in a spreadsheet or in Hadoop. The team has over a decade's worth of experience in providing safety, retention, and operational improvement analytics solutions. These solutions leverage data discovery, sentiment analysis, predictive analysis, and machine learning.

## *Blockchain in Transport Alliance*

Omnitracs is a proud member of the Blockchain in Transport Alliance (BiTA), a consortium of the foremost leaders in the trucking industry forging a path toward industry standards in blockchain use. All companies within BiTA share a unified mission of developing a standards framework, educating the market on blockchain applications, and encouraging the use of said applications through exemplary implementation.

## *About Omnitrac*

Omnitracs, LLC is a global pioneer of trucking solutions for all business models. Omnitrac's more than 1,000 employees deliver software-as-a-service-based solutions to help more than 12,000 customers manage nearly 1,100,000 assets in more than 70 countries. The company pioneered the use of commercial vehicle telematics thirty years ago and serves today as a powerhouse of innovative, intuitive technologies. Omnitrac transforms the transportation industry through technology and insight, featuring best-in-class solutions for compliance, safety and security, productivity, telematics and tracking, transportation management (TMS), planning and delivery, data and analytics, and professional services.

Learn how you can use our applications, platforms, and services to reduce costs, increase profitability, and stay competitive. Visit [www.omnitrac.com](http://www.omnitrac.com) and let us show you how you can save time and money.



omnitrac

717 N. Harwood Street  
Suite 1300  
Dallas, Texas 75201  
U.S.A.  
(800) 348-7227  
[www.omnitrac.com](http://www.omnitrac.com)