



WHITE PAPER

ACCELERATING GLOBAL TRADE PROCESSES WITH BLOCKCHAIN

AUTHORED BY:

Jeff Garzik, Co-Founder and CEO, Bloq

Matthew Roszak, Co-Founder and Chairman, Bloq

William Nieuwsma, Vice President, Government Strategy, Bloq

Troy Benjegerdes, Financial Cryptography Economics Engineer, Bloq

Alan Cohn, Advisor, Bloq



ENTERPRISE
GRADE
BLOCKCHAIN

[BLOQ.COM](https://bloq.com)

ACCELERATING GLOBAL TRADE PROCESSES WITH BLOCKCHAIN

SUMMARY

- There is an opportunity to explore how emerging technologies could benefit Customs and Border Protection trade operations focused on Supply Chain Management, supporting the Trade Facilitation and Trade Enforcement Act of 2015 through the Automated Commercial Environment (ACE) and other CBP innovation efforts.
- Blockchain technology holds considerable promise to substantially improve supply chain security and transparency. Blockchain's inherent architectural attributes solve several weaknesses in current trade IT systems and processes to ensure information immutability and transaction auditing, thereby increasing trade value capture and value creation. Current CBP innovation initiatives can realize their full potential while trade enforcement is improved. The benefit to industry is that goods turnover rates are improved and the trade playing field is leveled against value-destroying practices, delays, and fraud.
- We propose a permissioned, federated network based on blockchain to demonstrate how this technology can impact provisioning and supply chain management processes. Blockchain offers a wealth of efficiency, security, and auditing improvements, and is directly relevant to CBP's trade oversight mission.

ANATOMY OF A BLOCKCHAIN

A blockchain is a distributed electronic ledger that completes and stores all transactions of digital assets. It is de-centralized without a main server and can be created in a public (permission-less) or a permissioned form. Transactions of assets are permanently recorded and transparent for all participants, while participant account information is private. A high degree of automation in executing network and business rules provides rapid adjudication-as-a-service for transactions, either between CBP/Partner Government Agencies (PGAs) and trade participants or between trade participants themselves.

The anatomy of blockchain networks is described as follows:

- Network, enforcement, and business rules are run over a cloud of distributed routers as a first layer.
- A wallet provides each user interface to the blockchain and provides both a browser capability, a view of assets stored within the wallet, and a dashboard for viewing network activity, transactions, and metrics.
- The blockchain software stack contains routers, wallets, and middleware in the form of a software development kit (SDK).
- The SDK contains application building tools, testing, software libraries, and templates. The SDK is intended for participants that wish to build their own applications and the typical trade participants will not need to access the SDK to operate their business and comply with trade regulation.

- An analytics engine informs the wallet dashboard.
- A smart contract¹ engine (oracle) to execute any level of multi-party agreements automatically when previously agreed criteria are met.

BLOCKCHAIN FACTORS AND VALUE

Blockchain provides significantly enhanced data and network security, transaction transparency, and data immutability through its de-centralized, peer-to-peer network architecture. These blockchain factors can be described by their technical attributes and effect on value:

- **Authentication** - participants' identities are verified and network users cannot make changes to the blockchain database.
- **Cryptography** - PKI and digital signature security prevents the strongest intrusion attempts. Cryptography plays a constant role in every validation action and is unsolvable for the foreseeable future, providing protection against cyber intrusion and insider maliciousness.
- **Uniqueness** - participants cannot double-spend assets, nor counterfeit digital assets.
- **Immutability** - transactions can never be rewritten or forged, significantly reducing fraudulent activity.
- **De-centralization** - No central server node means that many (or even most) nodes may be lost without losing network functionality (high resiliency).
- **Validity** - participants are not required to trust each other as servers validate user data and requests continuously.
- **Permissionless** - an open network for participants that do not need to log on to a central authority, and for whom trade does not stop in the event of ACE downtime.
- **Automation** - adjudication-as-a-service and smart contract execution that significantly reduces wait times for administrative actions and decisions.
- **Trust-shifting** - validated accounts/users of suppliers are immutable and cannot be spoofed. Supplier participants trust the network rather than each other for validation and reduce risk of fraud or theft.

The most valuable blockchains are open-source, providing the maximum visibility of code and the ability to continue to innovate value-enhancing solutions over proprietary architectures and software stacks.

Each blockchain factor provides a path towards value capture (cost reduction, cost avoidance) or value creation (enabling higher turnover margins and reaching additional market participants). Just on the premise of securing both participant and authority data networks, significant insurance costs may be avoided and the Cost of Capital may be reduced. These two value aspects alone can validate the potential of blockchain networks.

¹ https://en.wikipedia.org/wiki/Smart_contract.

BLOCKCHAIN ARCHITECTURES

Transactions made at the blockchain data layer are system agnostic, allowing interoperability with Business Resource Planning (BRP) and Customer Resource Management (CRM) systems in industry and government. The most agile blockchains are not restricted in either the services or applications that run on top of them, and can also interoperate with different flavors of blockchain (bitcoin-based, Ethereum, Hyperledger).

The de-centralization of nodes is an important factor in the network resiliency of blockchain. Without central or critical nodes, no single or distributed network outage causes a system-wide failure and the trade network may continue to operate with a minimum of operational nodes.

VALUE DRIVERS FOR CBP AND THE TRADE INDUSTRY

The ability to deploy a secure, immutable data architecture via blockchain provides both Value Captured and Value Created for its participants, some of which are summarized in the table below:

CBP / PGA

DRIVER	VALUE CAPTURE	VALUE CREATION
Cyber security	Cost savings from data breach responses, remediation costs	Trust in government data and privacy security
Regulatory Compliance	PGA automation for trade compliance	Easily auditable transactions
IT Interoperability	Document Image Systems (DIS) and ACE Portal ride on blockchain foundation Business rule changes are tested before implementation	Easily scales to accommodate additional participants Open source software maximizes Total Cost of Ownership
Network Resilience	Low infrastructure investment Loss of multiple nodes will not impact network performance, nor lose data	Highly flexible expansion and upgrade capabilities
Ease of Revenue Collection	No third-party approvals, intermediation required	Future Smart Contracts implementation allows automatic bonding, payments

TRADE INDUSTRY

DRIVER	VALUE CAPTURE	VALUE CREATION
Cyber security	Cost savings from data breach responses, remediation costs, insurance	Intellectual Property security
Regulatory Compliance	Customs automation for trade compliance	Easily auditable transactions
IT Interoperability	Document Image Systems (DIS) and ACE Portal ride on blockchain foundation	Easily scales to accommodate business growth Open source software maximizes TCO and invites innovation
Network Resilience	Very low infrastructure investment Loss of own nodes will not impact network performance, nor lose data	Highly flexible trade partner expansion and international participation
Ease of Revenue Payments	No third-party couriers or intermediation required	Future Smart Contracts implementation allows automatic bonding, payments
Waiting Times	Trust in transaction data by all parties allows swift approvals	Reduced risk in operational performance allows a lower Cost of Capital

BLOCKCHAIN IMPLEMENTATION EXAMPLE

With practical concerns over fair trade issues present and lingering², we can make an export example of how blockchains would function in the produce trade by tracking grain shipments back to the farm-of-origin.

A blockchain shipment or container identification and tracking solution would negate the possibility that intermediaries could intentionally mislabel conventional produce as organic to make huge profits.

² <http://www.midwestshippers.com/single-post/2017/03/06/Organic-farmers-concerned-about-possible-fraudulent-grain-imports>

For instance, there is a significant probability that containers of soybeans can be sold domestically to a buyer, who then ships the container to an overseas customer (or to a transport aggregator who ships them overseas) is received from an intermediate port labeled as 'Organic Soybeans' with the exact same contents present during its originating shipment in the US. The end customer pays the \$13/bushel organic price, or about \$3 a bushel over what the original producer is paid. A 900-bushel load from an independent producer, sold fraudulently at organic prices by intermediaries, provides half the profit to the shipper(s), and half to enable the fraudulent process payouts.

A blockchain solution would ensure the immutability of the shipment contents, origin, quality, and provide time-stamping of transactions by shipping participants. Relabeling a container creates a huge cost (if wholesale product replacement is attempted) or a dispute over which record contains the correct shipment (container or blockchain record). The blockchain record cannot be changed and is always the true record with an auditable history of transactions behind it.

In addition to cyber security and records transparency, blockchain offers additional value creation in the form of scalable supply chain finance options. Markets can price commodities in terms of a blockchain token, and provide buyers and producers with a way to get their currency on and off the blockchain. In this case, the base token market cap may be determined by the market cap of the underlying commodities traded on that blockchain. A full blockchain solution could also enable a lower-risk, on-the-spot micro-finance options in case of unexpected needs during transit. Assets are easily verified, collateral confirmed, and tokens may present an addition liquidity layer for faster transactional ability. In the case of processed materials (such as metals), a shipment record can contain specifications and tolerances to describe the qualities of material properties.

The same benefits apply in the case of imports. Origination shipping documents provide supplier/producer identification, transportation route and mode, timing, quality, etc. that reduces importing risks and should identify when "dumping" practices are present. Pricing substantially below market may be automatically flagged.

THE AUTOMATED COMMERCIAL ENVIRONMENT (ACE) AND SINGLE WINDOW

With the transition to ACE and the Single Window, CBP has greatly simplified the administrative burden on the trade industry. Permissioned blockchain architectures will provide immutable, trusted data and speed government responses to action requests that can significantly reduce error rates in transmitted commercial information and wait times in response to requested actions. All parties (CBP, Partner Government Agencies, Industry partners) continuously work from the same, immutable data. Reducing wait times even further through a blockchain architecture may result in significant savings and reduced cash flow requirements. Lower error rates on data entry reduces the administrative efforts required to submit accurate transactions and further reduces waiting times.

SUMMARY

The operational approach to CBP's Trade Enforcement is³ :

- Detect high-risk activity
- Deter non-compliance
- Disrupt fraudulent behavior

Blockchain architecture permits data security and immutability in a format that has not been available before; it is no surprise that banks, asset holders, financial institutions, insurance companies, retail giants, transportation companies, supply chain vendors, and central banks are examining potential use cases for blockchains. By removing trust from individual users and creating a cryptographically secure network, participants can not only create immediate savings but also simplify regulatory compliance, payments, approvals, and other actions that previously took significant amounts of time.

CBP's deployment of ACE and the Single Window are a superb complement to the power of blockchain networks to validate and automate asset transfers, manifest authentications, cargo release, revenue payments, and a host of future secure automation (smart contracts) capabilities. The question of who is in control of the true record of trade transactions will not be in doubt because all participants share truth data equally. Fraudulent records alteration and cyber system breaches can be drastically reduced through use of blockchain technology. Blockchain innovation will also enable CBP innovation to easily scale across global participants with disparate business systems, and provide value-creating opportunities for trade participants.

³ <https://www.cbp.gov/trade>