Whitepaper

# Blockfreight™ the blockchain for global freight.

Julian Smith
Co-Founder & CEO, Blockfreight
julian.smith@blockfreight.com

10th Jun, 2016 | Version : **Public Release v 1.0.1**

**Abstract: Blockfreight™** | The blockchain of global freight.

# Contents

**Version [ Public Release 1.0.1 ]** [1]

**Errata Notice:**

Please, if you find any errors in fact, grammar or formatting or would like to suggest additional references or resources - help make this better! Email julian.smith@blockfreight.com

---

[1] This white paper describes planned functionality but not necessarily the current state of Blockfreight™

# 1. Introduction

**April 26th** | This day now marks two revolutions in freight, 60 years apart. The first was in 1956 with the launch Malcom McLean's shipping container introducing the era of modern container shipping.[2] On April 26th, 2016 we launched Blockfreight™ the blockchain of global freight introducing the era of distributed automation, audit and settlement.

The genesis block of a new era for the digital security, trust, authentication, record keeping and chain of custody data associated with each movement of global freight.

Where the introduction of shipping containers reduced costs and increased the speed of international trade[3], so too will transaction containers of data on the Blockfreight™ network.



**Image:** Courtesy of Maersk Group, Copyright © 2006

Blockfreight™ is an open network blockchain allowing stakeholders to have access to an advanced global ledger and just like the ISO 668 container before it, this is a global trade optimisation technology.

The Blockfreight™ network solves the inefficiency and variability in the data associated with each and every movement of container freight.

---

[2] Cudahy, Brian J. "The containership revolution: Malcom McLean's 1956 innovation goes global." *TR News* 246 (2006).
[3] Levinson, Marc. *The box: how the shipping container made the world smaller and the world economy bigger*. Princeton University Press, 2010.

## 2. Industry Tools

### a. Tools of today

    i.    Bill of Lading
    ii.    Freight Forwarders
    iii.    Shipping Lines
    iv.    Government Customs Agencies
    v.    Telex Release for quick shipments
    vi.    Banks [Generally the BoL is used for DoP and LoC payment methods]

### b. Solutions of tomorrow

    vii.    Value add applications on top of our stack. Built by individuals with permissionless, innovation or by companies and stakeholder development teams and independent software vendors (ISVs) who build a businesses on top of the Blockfreight™ network.
    viii.    The Blockfreight™ blockchain of global freight.

Built on the example of the Bitcoin peer-to-peer electronic cash system[4], the core prior art example of the practical embodiment of an openly participatory network and blockchain.

Where Bitcoin is deliberately designed and well suited to the application of peer-to-peer money/electronic cash. Blockfreight™ deliberately designed and well suited to the needs of the international shipping of cargo freight.

In an open blockchain such as Blockfreight™ stakeholders participate in the scaling of the network. This participation is in the form of scaling the data security and management of the application stack by participating in the validation and distribution of its content.

---

4 Nakamoto, Satoshi. "Bitcoin: A peer-to-peer electronic cash system." 31 Oct. 2008.

# 3. Key Concepts in Blockfreight™ defined

**a. Blockfreight™ components:**

[ **Blockfreight R&D** ] [I] [ **Blockfreight™ Open Source Project** ] [II]
[ **Blockfreight Inc** ] [III] [ **Blockfreight™ Token Sales** ] [IV]
[ **Blockfreight™ Token** ] [V] [ **Licensed Sales** ] [VI] [ **Token Exchanges** ] [VII]
[ **APIs** ] [VIII] [ **3rd Party App** ] [IX] [ **Partner Networks** ] [X] [ **Partner platforms & SaaS** ] [XI]
[ **Validator & Node** ] [XII] [ **JSON ruleset** ] [XIII] + [ **Ethereum Smart Contracts** ] [XIV]
[ **Blockfreight™ network & blockchain** ] [15]
[ **IPFS** ] [XV] [ **Bitcoin** ] [XVI] + [ **Ethereum** ] [XVII]

## Blockfreight R&D

Blockfreight™ begins life as a research and development project. The past year was spent on developing the system design and researching options for the underlying technology stack through commercial research and development by [I] Blockfreight R&D (Australia) resulting in the Blockfreight™ Open Source (MIT) project [II] **https://github.com/blockfreight**.

## Blockfreight™ Open Source Project

The codebase posted at Github is Open Source (MIT) licensed for all network participants and developers within the freight community to collaborate on and communicate around. If you are interested in developing on Blockfreight™ network simply email [**support@blockfreight.com**] and join our #Slack Channel @ **blockfreight.slack.com**.

## Blockfreight Inc

The Blockfreight™ network fee, anti-spam measure is based on the [V] BLOCKFREIGHT.XCP software access token. [IV] Blockfreight Inc manages the licensing of sales of BLOCKFREIGHT.XCP software access tokens. The availability of [VI] BLOCKFREIGHT.XCP is commercially managed support the business and early token sales will be made available to interested parties at a discount on the standard full retail price of USD $1 / BLOCKFREIGHT.XCP.

The Blockfreight™ network is open by design and open by participation in the network's rules of governance which are set by the market demands and practical realities of freight as expressed by validator nodes in consensus voting on network for rule adoption and changes.

*In an open blockchain such as Blockfreight™ stakeholders participate in the scaling of the network. This participation is in the form of scaling the data security and*

*management of the application stack by participating in the validation and distribution of its content.*

## Blockfreight™ Token Sales

Token sales can be conducted by the company or any licensee or agent. The Blockfreight™ [BFT:XCP] tokens | Open of availability commenced Jun 1, 2016.

## Blockfreight™ Token

The Blockfreight™ [BFT:XCP] tokens are the network fee to put a transaction onto the blockchain. BLOCKFREIGHT.XCP is an asset on the Counterparty platform which is built on the Bitcoin digital currency network.

## Licensed Sales

Blockfreight Inc will license sales of Blockfreight™ token.

## Token Exchanges

Many exchanges exist around the world where Blockfreight™ [ BFT:XCP ] tokens may be offered or exchanged for Bitcoin, Dollars, Euro, Yuan (RMB) or Yen. (Secondary market).

## APIs

Validators on the network may be closed or open to requests via web based web APIs

## 3rd Party App

Many companies and applications may be layered on the Blockfreight™ network and blockchain. This app economy will serve the industry and consumers.

## Partner Networks

A merkle hash of the Bitcoin network is included in the Blockfreight™ blockchain, on average every six (6) blocks.

## Partner platforms & SaaS

Software designed for industry and consumers can grow on the Blockfreight™ blockchain.

## Validator & Node

The Blockfreight™ blockchain does not mine but rather relies on a peer-network of bonded-stake validators which also act as network nodes. Nodes participate in voting network rules into consensus. Validator bond stake into the network and will be entitled to receive a share of network fee.

### JSON ruleset

The Blockfreight™ blockchain transaction (TX) is defined within the JSON ruleset for the network available and published at our GitHub account.

### Ethereum Smart Contracts

The Blockfreight™ transaction (TX) may reference an ethereum smart contract.

### Blockfreight™ network & blockchain

The Blockfreight™ network is a peer-to-peer gossip network for broadcasting and transmitting unconfirmed transactions (TX) and transfer of Blockfreight™ blockchain blocks.

### IPFS

Inter Planetary File System (IPFS) is a permanent file system to reference any store of transaction binary data.

### b. Application and network structure

An overview of the Blockfreight™ network components:

> [ **Validator** ] [ **Application** ]
> [ **Blockchain** ]

**Validators:** Act as nodes[5], validate transactions, vote on rules, provide API services
**Application:** Defines TX rules-set [Blockfreight™ reference client available for download at https://blockfreight.com/download Distributed in OSX, Windows Server and LINUX installs.
**Blockchain:** Distributed ledger of all valid and included TX

### c. Related work - From Bitcoin to ISO standards

Blockfreight™ is preceded by a significant body work in the technology space. Most notably Bitcoin: A Peer-to-Peer Electronic Cash System[4] as a practical example and application of network systems using proof-of-work to provide a level of Byzantine fault tolerant within a consensus network. The Bitcoin blockchain and digital currency is a fundamental building block and network primitive of the Blockfreight™ network.

After the release and operation of the Bitcoin network an extension to the electronic cash application for Bitcoin was created by Counterparty[6] in 2014 in the form of an open assets distributed financial exchange platform. The Blockfreight™ token (Blockfreight™ network fee) is a asset issued on the Counterparty protocol BLOCKFREIGHT.XCP

---

5 Full nodes, per Bitcoin

6 "Protocol Specification | Counterparty." 2015. 10 Jun. 2016 <http://counterparty.io/docs/protocol_specification/>

Another project adding utility in the form of a platform for distributed execution of applications (contracts) is the Ethereum[7] network introduced by Vitalik Buterin in 2013. The early specifications and network development work was undertaken in 2014 with the support of a crowdfunding token sale in August of that same year. By early 2015 the test network was in release and the initial Frontier release was launched by July. By 2016 the network is in Homestead release with a live smart-contracting platform which has met with strong interest and attracted an active and engaged community of both developer and commercial interest. The progress on delivery of a stable environment affords inclusion of an Ethereum based smart-contracts layer within the Blockfreight™ specification so as to allow Blockfreight™ to reference applications (contracts) running on the Ethereum network.

In order to draw on the relative strengths of these platforms (Bitcoin network, Counterparty protocol and Ethereum network) the design of the Blockfreight™ blockchain of global freight requires flexibility and the ability to define the network specific rules and data structures. We sought to employ a modular ruleset and to ensure we allow the protocol to evolve over time. These attributes were offered in our selection of Tendermint[8]. The Tendermint project has been the core technology underpinning Eris Industries consensus layer[9].

One of the goals of Blockfreight™ is to define a standard for blockchain freight data. Specifically drawing upon the ANSI EDI Standards[10] for data exchange and the work of GS1 ASN[11] around standards for Bill of Lading payload. It is envisaged that industry participation in standards definition, potentially including application to ISO standardisation should form part of the remit for this project. Our aim is to consult with standards making bodies to ensure wide adoption and clear definition of the Blockfreight™ protocol is achieved.

### d. Key concepts of the Blockfreight™ network

It is proposed that with the introduction of Blockfreight™ as the blockchain of global freight we will witness and enable a number of application and services for the global supply chain to be built on top of the network which allow a new era of efficiencies through automation of markets and resource allocation to be introduced. These applications around automation and efficiency may take full advantage smart-contracts afforded by the Blockfreight™ network.

The data within the Blockfreight™ blockchain reflects the agreed common state which attains network consensus and thereby serves as an incontrovertible record.

---

7 Buterin, Vitalik. "Ethereum white paper." 2013.

8 Kwon, Jae. "TenderMint: Consensus without Mining." *URL http://tendermint. com/docs/tendermint {_} v04. pdf* (2014).

9 "Company Blog | On Eris and Tendermint: Application and Consensus." 2016. 10 Jun. 2016

<https://blog.erisindustries.com/philosophy/2016/03/02/eris-and-tendermint/>

10 "ANSI - American National Standards Institute - EDI Basics." 2013. 10 Jun. 2016 <http://www.edibasics.com/edi-resources/document-standards/ansi/>

11 "GS1 Model for Supply Chain Processes in Healthcare, Part I ..." 2015. 10 Jun. 2016

<http://www.gs1.org/sites/default/files/docs/EDI/GS1_Model_for_Supply_Chain_Management_in_Healthcare_Part1_Framework_Guideline.pdf>

Blockfreight™ is smart contract enabled and smart contract controlled. Development of participation rules to address security, the governance framework & governance systems is the core challenge for the development team and network participants during the evolution of Blockfreight™ network.

## d. Blockfreight™ [BFT:XCP] network fee

A vital piece of the economic bedrock of the Blockfreight™ network is the inclusion of a network fee. A Blockfreight™ token [BFT:XCP] is required for each TX included in the chain.

Absent this charge, a "Free" or no charge systems give rise to an incentive for capturing end user data for analytics, targeting and resale and encourages closed systems of centralised control. By contrast the Blockfreight™ blockchain is an open network operated by peers in a distributed consensus model with payload data available exclusively to parties to a transaction.

Another core benefits of a paid network is that it provides a clearly defined revenue stream to support the operational costs of consumables and infrastructure, development and allows for sponsorship and coordination of a community of innovators to work on scaling the APIs and network features of the Blockfreight™ network over time.

While it is true that a participatory architecture reduces cost where the community of users participate in the scaling of the architecture and fabric of the network there still needs to be a way to address the needs of support, development and advocacy functions through time in a sustainable way.
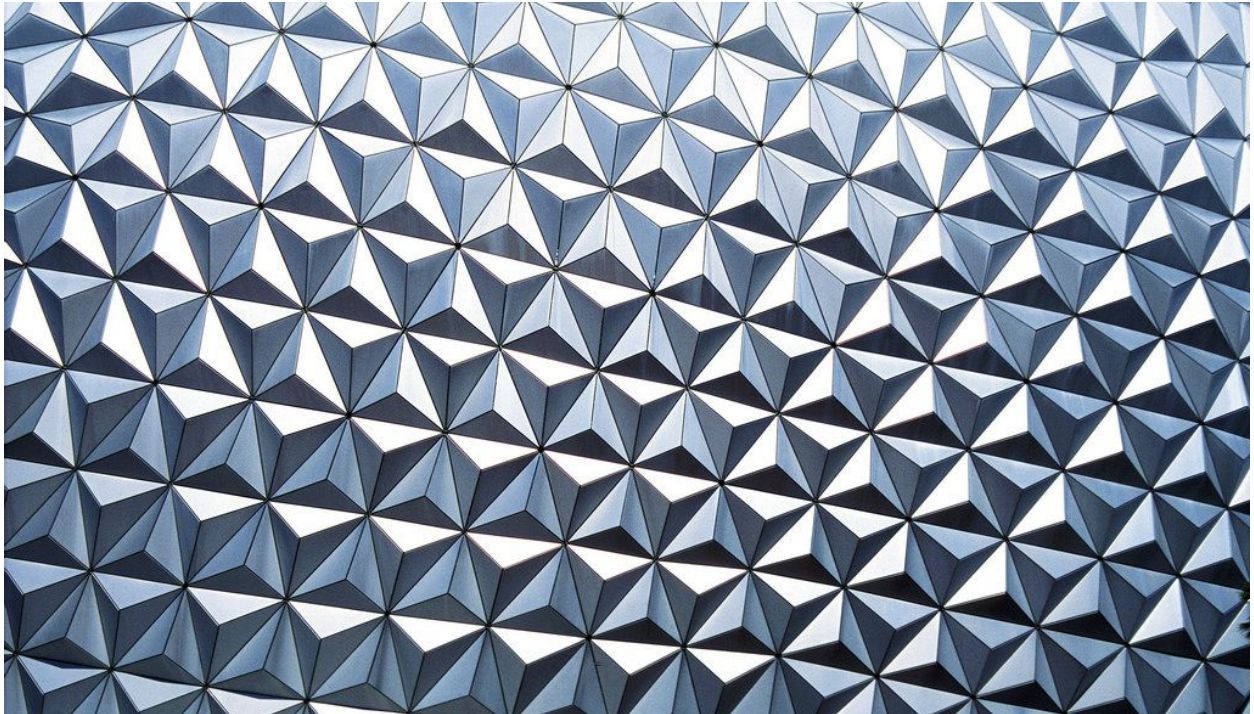
# 4. Blockfreight™ goals



**Image:** Experimental Prototype Community Of Tomorrow (Epcot) Center, Orlando Florida | Copyright © Walt Disney World Resort

Like the pyramid fabric in this structure of the image above, one key characteristic of a blockchains are the interlocking and mathematically (cryptographic) signed data sets form an integrity structure acting as the self-evidence of structural validity as measured by the ruleset applied to them and as determined by the signing parties assuming shared consensus around specific rulesets.

With Blockfreight™ the blockchain of global freight we unlock the opportunity for new and innovative applications serving the needs of the global supply chain to emerge. Delivering a robust open platform on which to built automation, audit and market based systems.

Blockfeight Inc will actively invest in early-stage startups through the Blockfreight Innovation Fund (BIF) to seed development of interesting, impactful and scalable use-case applications of Blockfreight™ network.

# 5. Blockfreight™ consensus network

**a. Validation**

A validator on the Blockfreight™ network is also a node. Providing transaction review, validation and transmission to peers.

**b. Agreement (Voting)**

The ruleset of the network is set by the network participants in a round of voting.

These consensus rules form the basis of validation of transaction and allowing (or denying) them entry to the Blockfreight™ blockchain.

**c. Utility**

A blockchain of global freight allows reliance on the record of account as an immutable digital record. This unlocks the opportunity for value added applications such as performance based smart-contracts and chain of custody record managment and compliance systems to be built.

**Blockfreight™** | The blockchain of global freight.

# 6. Discussion

1. **Will it scale?** Tendermint allows for 10k TX/sec with a block rate as high as 1 block/sec. We should be able to accommodate immediate and future needs. Moving to commercial implementation will afford more opportunity for empirical testing metrics.
2. **Does it need Bitcoin?** Yes. Both for the network fee [BLOCKFREIGHT.XCP] which is a Counterparty asset, and for the merkle root chain hashing (on average every 10 Bitcoin blocks) providing audit locking and validation for chain-of-custody chain-of-record data sets. Openstack permissionless.
3. **Is it Open Source?** Yes. We release all code under an Open Source (MIT) license.
4. **What data goes into a TX?** The primary payload of a Blockfreight™ transaction is a an electronic Bill of Lading (BoL). This is a document generated by a shipping line whose purpose is to document ownership and facilitate transfer of ownership between seller and buyer. It is one of the most important commercial documents. It is by definition tied to payment.
5. **Why a BoL?** The BoL document is accepted as proof of ownership by banks and facilitates payment settlement. For example a swap of BoL is done by banks in the Letter of Credit (LoC), Documents against Payment (DoP), or TT against copy of documents in more trusted transactions.
6. **Who are likely to form the interested parties of a consensus block?** The three parties who might require an improved solution are buyers (Walmart), sellers (Li&Fung), and banks (HSBC). The solution (platform) is to create a middleware that allows those parties to interact. They will demand enterprise standards based software.
7. **Why not build on a private Ethereum blockchain running on Azure to integrate with R3's 42 banks, and Project ConsenSys (Deloitte) at same time seek buy in from logistics industry?** There is no barrier to our code being transferred into a project like this and we will support any ISV in the space choosing to experiment or build a solution with Etherium at it's core. Blockfreight™ is chaining to the Bitcoin blockchain at it's core.

# 7. Acknowledgements