Blockchain for trade: becoming real
Lessons from real world implementations

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A private sector overview of relevant blockchain initiatives

• IBM, Maersk and others in the trade logistics domain
  • TradeLens, Bill of Lading (PIL, TradeTrust), Global Shipping Business Network (CMA CGM etc)

• Payments
  • Ripple, SWIFT, Stellar (Worldwire)

• Trade Finance
  • R3 Voltron, we.trade, eTradeConnect

• Food supply chains and agricultural commodities
  • ADM-Bunge-Cargill-Dreyfuss for commodity markets, IBM Food Trust with Walmart
**BLOCKCHAIN: WELL SUITED FOR SUPPLY CHAINS**

Blockchain addresses the underlying challenges inherent in collaborating across a distributed, fragmented supply chain ecosystem.

**SHARED LEDGER**
- Append-only distributed system of record shared across business network
- A network of industry participants maintains a distributed, permissioned ledger with copies of document filings, relevant supply chain events, authority approval status, and full audit history; every change results in a new, immutable block

**SMART CONTRACT**
- Shared business logic governing what transactions may be written to the ledger
- Cross-organizational business processes, such as cargo title transfer, are pre-programmed and built into Blockchain and distributed to and executed on the network, preventing any member from changing the business logic

**PRIVACY**
- Ensuring appropriate visibility; transactions are secure, authenticated and verifiable
- Cryptography enables permissioned access so only the parties participating in a specific shipment can submit, edit or approve related data

**TRUST**
- Transactions are endorsed by relevant participants
- Information such as documentation filings and authority approvals can only be changed if endorsed by the parties taking part in the shipment; full audit history maintained on the Blockchain

**TRADELENS**
TRADELENS

An open and neutral blockchain-based platform that is digitizing the global supply chain and transforming trade

- The platform empowers faster and more efficient, transparent and secure global trade
- TradeLens is built for the industry and offers benefits to trade participants from across the supply chain ecosystem
- IBM and Maersk are developing the platform under a joint collaboration, with significant input from and participation by the industry
- An Advisory Board is being formed to help shape the platform and drive standards
- TradeLens is live in production today, processing millions of transactions per day

OUR JOURNEY

- **September 2016**
  Maersk and IBM agree to invest in a blockchain prototype to assess feasibility and value
- **March 2017**
  Initial pilot assessing impact on shipments of avocados from Mombasa to Rotterdam confirmed viability and value of blockchain platform; Maersk and IBM agree to pursue
- **January 2018**
  Beta release of the platform and launch of Early Adopter program; trials underway
- **August 2018**
  Formal launch of the TradeLens platform 92 participants signed on
- **September 2018**
  TradeLens Limited Availability Release
- **December 2018**
  TradeLens General Availability Release 1.5 million events per day published to the platform
TRADELENS BLOCKCHAIN BUSINESS NETWORK

Not exhaustive list of milestones managed by platform

Not exhaustive list of documents managed by platform
SHIPPER-CENTRIC MODEL TO NETWORK MODEL

This requires trust.
DATA SHARING MODEL

The supply chain ecosystem requires a common object model and vocabulary that supports the business models and relationships that exist in the business world.

- Model is based on UN/CEFACT Supply Chain Reference Data Model
- Shipments and consignments are related many-to-many
- Consignments are hierarchical
- Documents and milestones can be published at the shipment and consignment level
- An organization can have a role in a shipment or a consignment

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PARTICIPANT TYPES AND ROLES

Access rights are determined by organization role and resource type.

**CARGO OWNER**
- Seller
- Buyer
- Exporter
- Importer
- Consignor
- Consignee
- Transport Service Buyer

**AGENT**
- Origin 3PL
- Destination 3PL
- Export Customs Broker
- Import Customs Broker

**OCEAN CARRIER**
- Ocean Carrier
- Transport Service Buyer
- Consignor
- Consignee

**TERMINAL OPERATOR**
- Origin Marine Terminal
- Destination Marine Terminal
- Transshipment Terminal
- Inland Terminal

**TRANSPORT SERVICE INTERMEDIARY**
- Transport Service Intermediary
- Transport Service Buyer
- Consignor
- Consignee

**INLAND TRANSPORT SERVICE PROVIDER**
- Rail Operator
- Truck Operator
- Barge Operator
- Feeder

**DATA AGGREGATOR**
- PCS

**CUSTOMS AUTHORITY**
- Export Authority
- Import Authority

**FINANCIAL SERVICES**
- Buyer’s Bank
- Seller’s Bank
- Insurance Provider

**DOCUMENTS SUPPORTED (TODAY)**
- Pro-Forma Invoice
- Commercial Invoice
- Packing List
- Booking Confirmation
- Shipping Instructions
- Export Declaration
- Bill of Lading
- Sea Waybill
- Arrival Notice
- Import Declaration
- Health Certificate
- Phytosanitary Certificate
- Veterinary Certificate
- Fumigation Certificate
- Inspection Certificate
- Certificate of Analysis
- Certificate of Origin
- Dangerous Goods Declaration
STANDARDS AND INTEROPERABILITY

TradeLens is committed to the promotion and adoption of industry standards and interoperability of platforms

**Information standardization**
The shipping industry so far has been lagging in adopting standards for basic concepts like time, place, and identity. We will work closely with our Industry Advisory Board, TradeLens participants, and standards bodies to help the industry coalesce around the use of widely adopted codes and data models. The TradeLens data model and access control scheme will align with the UN/CEFACT model.

**Interface standards**
Industry standards around the exchange of information have also been lacking. TradeLens is committed to openness, with all functionality surfaced via non-proprietary, publicly available APIs that are designed specifically for consumability and ease of integration. TradeLens will also increasingly offer standard integrations with ERP, TOS, TMS, and WMS packages.

**Blockchain interoperability**
While Blockchain information exchange between ledgers today is generally achieved by integrations using middleware, that will change in the coming years. For example, Hyperledger Quilt, an implementation of the Interledger Protocol allowing for a cross-ledger namespace and transfers of information between ledgers, will be a standard TradeLens intends to follow. It is also the intention that the TradeLens platform follows Blockchain-based standards evolving in the industry.
STANDARDS INVOLVEMENT

Business networks function better when members can communicate using a common language. Some types of supply chain communications use well-developed and widely adopted standards, and communities have formed in recent years to address other areas where gaps exist.

**Standards / Master Data**
- **Location Data**
  - UNECE – LOCODE Cities/Ports
  - SMDG – Terminals
- **Transport Data**
  - IMO – Vessel/Voyage ID’s
  - NMFTA – SCAC Carrier Codes
- **Time**
  - ISO – ISO8601
- **Identity**
  - WCO Trader Identification Number (emerging)
- **Business Objects**
  - UN/CEFACT SCRDM

**Communities/Organizations**
- Openshipping.org
- Digital Container Shipping Association (pending regulatory approval)
- UN, WCO
- GS1
- ISO/TC 307
# IT LANDSCAPE: THE TRADE ECOSYSTEM

## Systems of Record

<table>
<thead>
<tr>
<th>Cargo Owners</th>
<th>Agents / Intermediaries</th>
<th>Ocean Carriers</th>
<th>Inland Carriers</th>
<th>Terminal Operators</th>
<th>Customs Authorities</th>
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<tbody>
<tr>
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<td>TMS</td>
<td>TMS</td>
<td>TOC</td>
<td>National Single Window Systems</td>
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<td>Manual</td>
<td>Bespoke</td>
<td>PCS</td>
<td>PGA/OGA Systems</td>
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<td>Document Mgmt Systems</td>
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## Communication Mechanisms

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- **ERP**: Enterprise Resource Planning
- **SCM**: Supply Chain Management
- **TMS**: Transportation Management System
- **Bespoke**: Custom-developed software
- **UN/EDIFACT**: United Nations/Electronic Data Interchange for Administration, Commerce, and Transport
- **Spreadsheets**: Microsoft Excel, Google Sheets, etc.
- **API**: Application Programming Interface
- **XML**: Extensible Markup Language
- **Email**: Electronic Mail
- **Bespoke EDI**: Custom-developed Electronic Data Interchange
- **National Single Window Systems**: National programs for integrating and streamlining the exchange of trade-related information between traders and governments
- **PGA/OGA Systems**: Public-Private Agreement/Other Government Agreements systems
- **TOC**: Tracking and Operating Control
- **PCS**: Performance and Control Systems
ECOSYSTEM FEEDBACK
From Early Programs and Two Releases

- Clear definition of information sharing rules in participation agreements is critical to success
  - It's not enough to define rules and permissions in the technology stack: this information needs to be clearly articulated for other business stakeholders

- Agreements clearly state:
  - Information to be published
  - TradeLens’ rights to information published
  - Information available for consumption
  - Participant’s rights to information consumed

- Information sharing must be limited to entities with a legitimate need-to-know

- Preferences must be customizable at scale
**BLOCKCHAIN EBL PROJECT BACKGROUND**

- **Bill of lading (BL) is in use since 16th Century**
- **Functionalities:**
  - Receipt of goods
  - Evidence of the carriage contract
  - Title to goods
- **Issued by Shipping Line**
  - Original paper BL (with endorsement) is used to establish ownership
  - Original paper BL is required to take delivery of goods
- **BL Types**
  - Negotiable and Non-Negotiable BL

1. **Issue BL**
2. **Transfer BL**
   - 2.A Transfer BL
   - 2.B Transfer BL
3. **Surrender BL and take delivery**

*Diagram showing the process of bill of lading transfer with multiple parties involved.*
EBL PROCESS FLOW

Issuing EBL

- Shipper → Submit shipment instructions to shipping line
- Shipping Line → Review shipment instructions
  - Issue BL with title assigned to Shipper
  - Return Shipment instructions to Shipper

Transferring & Surrendering EBL

- Non-Negotiable
  - Shipper → Named Consignee/Buyer
  - Shipping Line
  - Negotiable
  - Named Consignee/Buyer → Negotiating Bank
  - Issuing Bank

Sharing EBL (read-only)

- Shipper, Negotiating Bank, Issuing Bank, Consignee
  - Current/Past Owner
  - Share selected EBL sections

- Customs
**SUMMARY OF EBL POC**

**Document Transfer**
- **Paper BL**
  - Traditional paper B/L: 5-10 days via courier service
- **EBL on Blockchain**
  - With EBL in seconds via blockchain network

**Document Handling**
<table>
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<tr>
<th>Feature</th>
<th>Paper BL</th>
<th>EBL on Blockchain</th>
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</thead>
<tbody>
<tr>
<td>Fraud</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Can be lost</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Speed</td>
<td>Slow</td>
<td>Instant</td>
</tr>
<tr>
<td>Security</td>
<td>Low</td>
<td>High</td>
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**Digitization**
- **Smart-form of Secure Data**
  - Traceable, tamper-proof flow of document/asset
  - Real-time information sharing over the whole BL lifecycle

**Features**
- Issue EBL
- Retrieve & Share EBL
- Transfer EBL
- Surrender EBL
- Real-time visibility & Transfer History
- API-based Design

**Control**
- **Real-time Title** Visibility & Transfer History (for SL)
- **Permissioned Information sharing**
- **Visibility to entire shipment lifecycle**

**Compliance**
- **Audit Trail**
- **Improved workflow management**

**Summary**
- **Risk Assessment**
  - Shorter Time
  - Reduce Cost
- **Provenance Support**
  - Increased Privacy
- **Paper B/L**
- **EBL**
- **EBL on blockchain**