Infusing Blockchain to Storage System Supply Chain

Michelle Lam, Senior Technical Staff Member, Supply Chain Engineering, IBM System
About this presentation
Overview

1. Blockchain Basics and Terminology
   a. Different Types of Blockchain
   b. What’s consider to be a good use case?
2. Blockchain for Business - Supply Chain Use Cases
   a. Global Trade Digitalization
   b. Food Safety
3. Storage System Supply Chain Use Cases
10% of global GDP will be stored on blockchains or blockchain related technology by 2027

US$ 176 billion business value added by blockchain by 2025, then surging to exceed $3.1 trillion by 2030

66% of banks expect to have commercial blockchain applications by 2020

US$ 23 billion estimated size of the blockchain technology market by 2021

Source: World Economic Forum

Source: Gartner

Source: IBM

Source: MarketsandMarkets
Blockchain History

Stuart Haber and Scott Stornetta 1991
- chain of blocks in cryptography
- Nick Szabo 1998
- coined the term of digital currency

Vatakil Burterin created Etherum
Different types of Blockchain

- **Public vs Private**
  - Who is able to write data onto the blockchain

- **Closed vs Open**
  - Who can read the data on blockchain

- **Permissioned vs Permissionless**
  - User’s role the same or not
Gartner’s Hype Cycle of Blockchain

https://www.gartner.com/document/3953756?ref=solrAll&refval=230687250&qid=eb5bdf4bc9bfa3b19586b8b52
What makes a good blockchain use case?

– Identifying a good blockchain use-case is not always easy!
  – However there should always be:

1. A **business problem** to be solved
   • That cannot be more efficiently solved with other technologies

2. An identifiable **business network**
   • With Participants, Assets and Transactions

3. A need for **trust**
   • Consensus, Immutability, Finality or Provenance
What makes a good first blockchain use case?

– First use-cases are even more difficult to identify!

1. A **limited scope**, but still solves a real business problem
   • Minimum Viable Product in a few weeks of effort

2. A smaller **business network**
   • Usually without requiring regulators and consortia

3. Allows for **scaling with more participants and scenarios**
   • Consider shadow chains to mitigate risks

Start small, succeed and grow fast!
Is blockchain a right solution to a problem?

*There is a business problem to solve*
*Where other technologies have failed*

- Benefits multiple parties / participants?
- Data privacy and security are paramount?
- Complex business contracts exist?
- Value in shared data and business logic?
- Transaction sequence and audit-ability are important?
- Trust between parties is difficult to achieve?
- High level of inefficiency in the process?
The golden rules for blockchain

A **business** problem to solve

An identifiable **business** network

A requirement for **trust** in the network
Blockchain for Business

Benefits of Blockchain

- **Saves Time**
  - Transaction time from days to near instantaneous

- **Reduces Risk**
  - Tampering, fraud & cyber crime

- **Increases Trust**
  - Through shared processes and recordkeeping

- **Removes Cost**
  - Overheads and cost intermediaries
The cost of global trade is estimated at $1.8 trillion annually\(^1\) with potential savings from more efficient processes of ~10%.

---

1) Maersk Strategy Group (May 19, 2016) based on World Bank data for World Trade Costs

---

More than $16 trillion in goods are shipped across international borders each year.

80% of the goods consumers use daily are carried by the ocean shipping industry.

By reducing barriers within the international supply chain, global trade could increase by nearly 15%, boosting economies and creating jobs\(^2\).

In many cases the administrative cost of moving a container is higher than the cost of physically moving it.
What?

• An open, extensible platform for sharing shipping events, messages, and documents across all the actors and systems in the supply chain ecosystem.

How?

• Providing shared visibility and shared state for container shipments

Benefits

• Increase speed and transparency for cross border transactions through real time access to container events.
• Reduced cost and increased efficiency through paperless trade
TRADELENS ADDS MAJOR OCEAN CARRIERS HAPAG-LLOYD AND OCEAN NETWORK EXPRESS

TradeLens July 2, 2019

Rapid adoption of TradeLens continues as Hapag-Lloyd and Ocean Network Express (ONE) Pte. Ltd. announced they will join the blockchain-enabled digital shipping platform.

BUILDING APIs FOR SHIPPING: WHAT WE’VE LEARNED SO FAR

Nis Jespersen June 18, 2019

TradeLens has been among the very first adopters of APIs for the shipping industry, so we’ve been through our share of trial and error. Now it’s time to share some of what we’ve learned.

NEW MEMBERS SET STAGE FOR NEXT WAVE OF TRADELENS GROWTH

TradeLens May 28, 2019

The addition of leading carriers will bolster what is already an extensive and diverse ecosystem of supply chain partners using TradeLens today. On this occasion, we thought it would be a great time to highlight a number of new and recent additions.
IBM Food Trust – Food Safety

1 out of 10 people get sick each year, and 420,000 die from foodborne illness.

80% of CPGs business are partially or entirely paper-based.

1/3 of fresh food is thrown out because it is considered unacceptable.

1 in 5 seafood samples is mislabeled worldwide (43% mislabeled in NYC).

Only 1 in 4 consumers trust today’s food ecosystem.

The root of these issues, and many others, are the lack of trust and transparency.

Sources: World Health Organization, Gravitas Study, FAO of UN, Oceana.
IBM Food Trust – Food Safety

What?
• IBM Food Trust is a set of modules providing traceability to improve food transparency and efficiency

How?
• Blockchain is used to create a trusted connection with shared value for all ecosystem participants, including end consumers.

Benefits
• Reduce impact of food recalls through instant access to end-to-end traceability data to verify history in the food network and supply chain.
• Help to address the 1 in 10 people sickened and 400,000 fatalities worldwide which occur every year from food-born illnesses.

Momentum is growing

The Electronics Industry, a complex ecosystem

Multi-party processes are often too complex, labor-intense, redundant and wasteful.
Our Motivation

Apply Blockchain to mitigate pain points in Electronics Supply Chain
Electronics Supply Chain Pain Points

How do you ensure your supply chain won’t have counterfeit issue?

All personal data wiped from this drive before decommissioning?

How do I know this is not a counterfeit item?

Malicious components?

Product Recall?
How Blockchain can help?

Provenance Blockchain provide a single, uncorrupted, holistic view of the asset’s history from inception to decommission.

- **Fraudulent products**
  - Problems in life without Provenance: Fraudulent products
  - Addressing them with Provenance on Blockchain: Authenticity
    - Proof of authenticity (verified claims) of an asset through its data or evidence attached to any transaction involving the asset.

- **Defective products**
  - Problems in life without Provenance: Defective products
  - Addressing them with Provenance on Blockchain: Traceability
    - Improved speed of access to asset information through a digital, shared, transparent ledger.

- **No transparency**
  - Problems in life without Provenance: No transparency
  - Addressing them with Provenance on Blockchain: Transparency
    - Structured data linking among independent entities that handle a common asset or associate with it, providing a traceable history of the asset’s change of custody and/or transformation.

- **Process Inefficiency**
  - Problems in life without Provenance: Process Inefficiency
  - Addressing them with Provenance on Blockchain: Trust
    - Improved trust lead to remove of process redundancy.
Storage Device Life-Cycle

**Forward Supply Chain**
- **Drive Mfg**
  - Drive Created by Drive Mfr
  - Create Drive
- **IBM**
  - Receive, Assembly, Finished Goods, FRU Stock
  - Update Drive
- **Customer**
  - Install Drive at Customer
- **Customer**
  - Failed Drive Return
- **IBM CE**
  - IBM Warehouse
  - Install Drive
- **IBM**
  - IBM Contracted Return Center
  - Decommission Drive
- **Seagate**
  - Refurbish or Decommission Drive
  - Restart Cycle

**Reverse Supply Chain**
- **IBM CE**
  - IBM Return Center
  - Validate Drive & Erase Drive
- **Drive Mfr.**
  - Contracted Return Center
  - Return to Drive Mfr.
- **Seagate**
  - Return to Drive Mfr.
  - Refurbish or Decommission Drive

**Actions**
- Create, Install, Validate, Maintain, Monitor, Replace, Recycle, retired
Part Provenance Blockchain Ecosystem
Part Provenance Blockchain PoC

Proposed Storage Device Life Cycle

Blockchain
Drive State, Authenticate & Secured Erase

IBM Manufacturing
Asset On Hand Internal Process Finished Goods FG Shipped

TSS & Warranty Orgs
Arrived to Customer Installed @ Customer Failure Event (Drives)

Seagate
Shipped to IBM Defective drive is received

IBM Teleplan
Return to Seagate Seagate Teleplan
In Warranty Return; Functional Check

SPO Drives Sorting Facilities
Return Scrap Warranty Status Drives Collection
Warranty & Scrap status

Replace & Return Asset
IBM System Supply Chain Blockchain

Use Case 2 - Supply Chain IoT
Use Case 3 - Customs Declaration

Use Case 1 - Parts Provenance

SUPPLIER

IBM

LOGISTICS & CUSTOMS

CLIENT
Electronics Supply Chain Blockchain Connection

End-to-End Supply Chain Data

Component & Raw Materials
- Raw Materials
  - Conflict minerals declaration
  - Material testing
    - Environmental
    - Mechanical properties
    - MSDS
- Components & Procured Assemblies
  - Traceability (assembly info)
    - Anti-counterfeit
    - Manufacturing data
  - Material Declarations
    - Environmental compliance
    - Conflict minerals
    - Battery compliance
  - Safety Certifications
    - EMI, flammability, electrical
  - Device documentation
    - Datasheet, outline, PWB pad layout, qual report
  - Customer notifications
    - PCN (and ECs)
    - Product discontinuance

Subsystem and System Assembly
- Raw Materials (solder, coatings, etc.)
  - Conflict minerals declaration
  - Material testing
    - Environmental
    - Mechanical properties
    - MSDS
- Components & Procured Assemblies
  - Connect to component blockchains
- Assembly (card, subsystem, system)
  - PWB Assembly
    - Card and stencil design,
    - 1st article inspection image
    - Traceability (assembly info)
    - Anti-counterfeit
    - Manufacturing data
  - Material Declarations
    - Environmental compliance
    - Conflict minerals
    - Battery compliance
  - Certifications
    - EMI, flammability, electrical
    - UL, other markings
  - System documentation
    - Manuals

System Install, Repair, Reuse
- Partner
  - Traceability (Assembly info)
- Customer
  - Traceability (Assembly info)
    - Improved recall
    - Analytics
  - Install information
  - Failure information
- Repair Centers
  - Part information
  - Failure analysis information
  - Return linkage
- Reuse
  - Connect to system, subsystem blockchains
Summary

• Blockchain is a transformative technology that can address counterfeit, traceability, transparency, process efficiency.

• We are moving beyond proof-of-concept.

• Work is needed to develop data exchange standards for industry adoption.

• Key to success is Collaboration.
We believe by strengthening our trust, we are empowered to change the world.

What will we solve together?

IBM Blockchain