

# IOT PLATFORM AND BLOCKCHAIN

# IBM BLOCKCHAIN GARAGE - WHO WE ARE?

## Garage @ Marina Bay

- Global consulting family
- Partnership with Startup and Tech Incubators
- Customers first mentality with Startup ingenuity and enterprise experience
- The best ideas have come from Garages



# The Business Value of Blockchain

**Blockchain is a shared ledger technology allowing any participant in the business network to see THE system of record (ledger)**



# Blockchain benefits



## **Saves time**

Transaction time  
from days to near  
instantaneous



## **Removes cost**

Overheads and  
cost intermediaries



## **Reduces risk**

Tampering, fraud  
& cyber crime



## **Increases trust**

Through shared  
processes and  
recordkeeping

# Blockchain for business ...

Append-only distributed system of record shared across business network

Shared ledger



Smart contract



Business terms embedded in transaction database & executed with transactions

Ensuring appropriate visibility; transactions are secure, authenticated & verifiable

Privacy



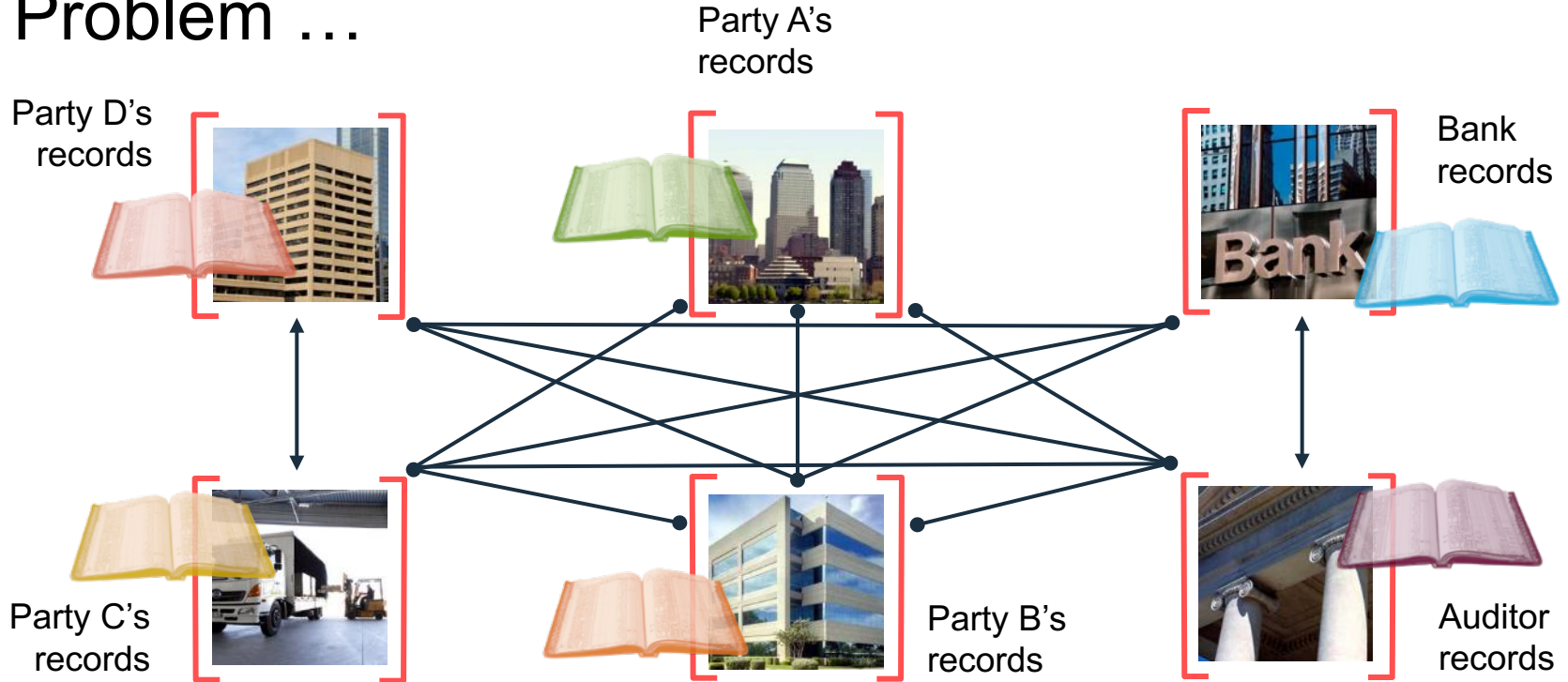
Consensus



All parties agree to network verified transaction

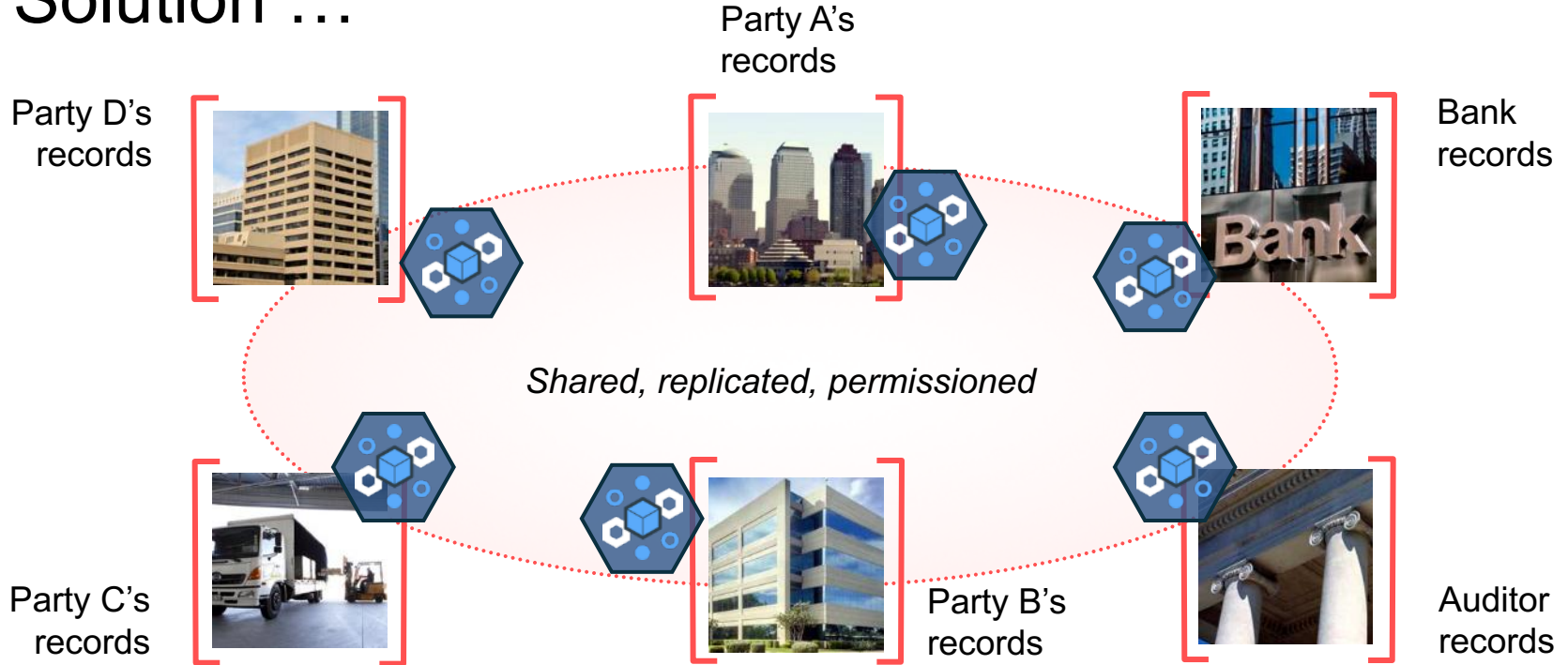
... Broader participation, lower cost, increased efficiency

# Problem ...



... Inefficient, expensive, vulnerable

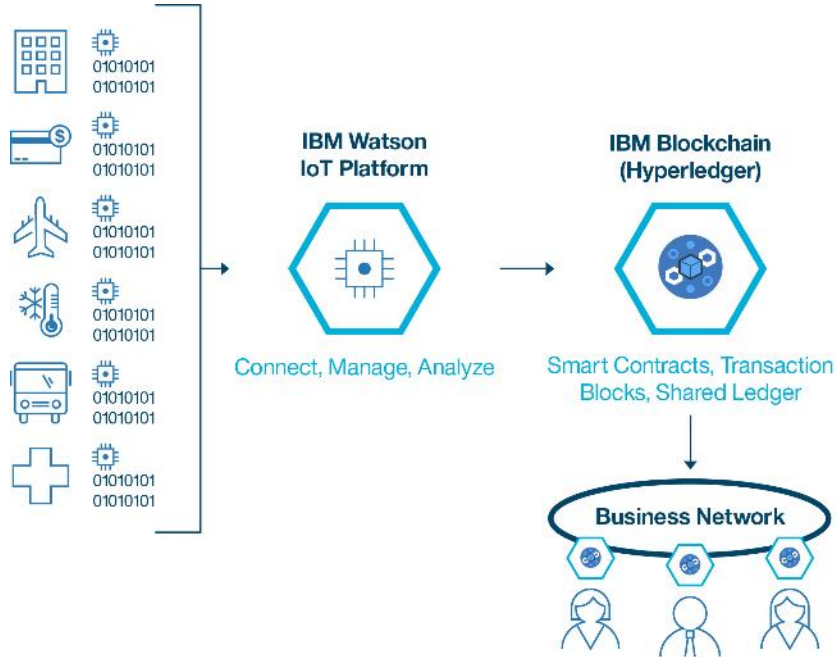
# Solution ...



... Consensus, provenance, immutability, finality

# INTEGRATE IOT PLATFORM WITH BLOCKCHAIN

## Enable physical devices to participate in blockchain transactions.



**Build trust** - between the people and parties that transact together. Blockchain enables devices to participate in transactions as a trusted party. While Person A may not know device B and may not trust it implicitly, the indelible record of transactions and data from devices stored on the blockchain provide proof and command the necessary trust for businesses and people to cooperate.

**Reduce costs** - enable participants to reduce monetary and time commitment costs by ultimately removing the 'middle man' from the process. Transactions and device data are now exhibited on a peer to peer basis, removing most legal or contractual costs.

**Accelerate transactions** - enable more transactions overall because the 'middle man' is removed from the process. Smart contracts allow for organizations to reduce time needed for completing legal or contractual commitments.



## HOW IT WORKS

- IBM Blockchain provides the private blockchain infrastructure of distributed peers that replicates the device data and validates the transaction through secure contracts.
- Watson IoT Platform translates existing device data, from one or more device types, into the format needed by the blockchain contract APIs. The blockchain contract doesn't need to know the specifics of your device data.
- Watson IoT Platform filters device events and sends only the required data to the contract.
- Storing IoT data as part of a indelible ledger on a private blockchain can help build trust across business networks.

# BLOCKCHAIN OPERATIONS

## **Deploy** - deploy a new smart contract

- Hyperledger contracts are written in GO.
- Hyperledger can deploy contracts by pulling them from a public, open, github

## **Invoke** - invoke a blockchain transaction (write operation)

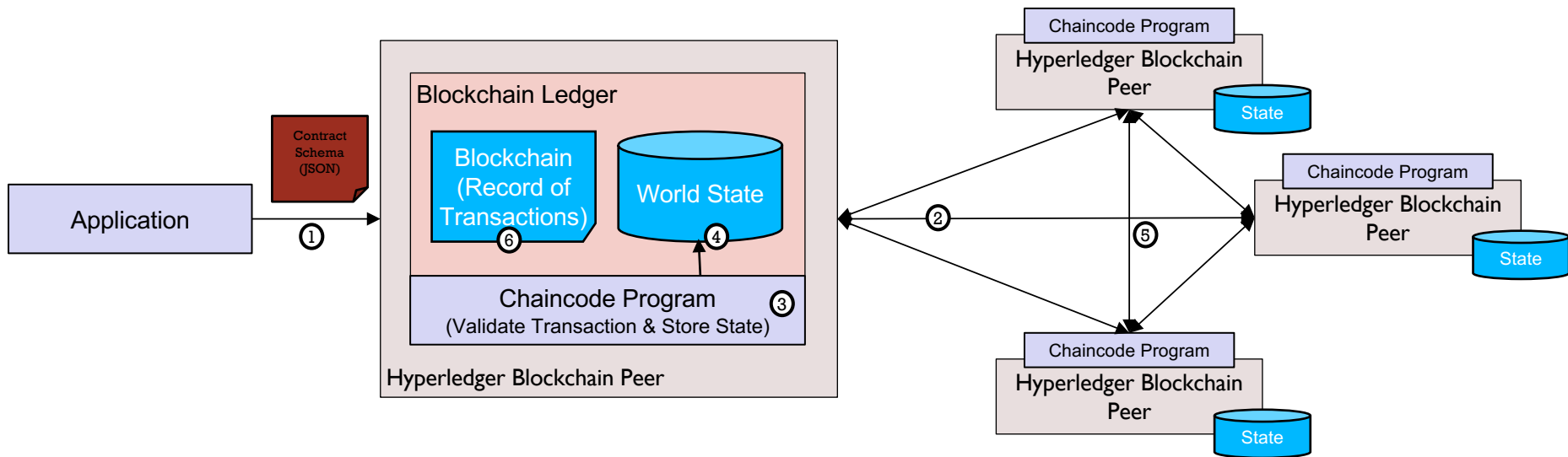
- Transaction data is passed to other validating peers for consensus.
  - Validates that > 50% of validating peers generate the same result when running the smart contract.
  - Transaction record is written to the blockchain and permanently secured.
  - Chain code stores state or history information in the world state database

## **Query** - retrieve data from a blockchain (read operation)

- Code for executing the query is written in the smart contract.
- Only runs on one peer and is not allowed to change the world state database (read only).

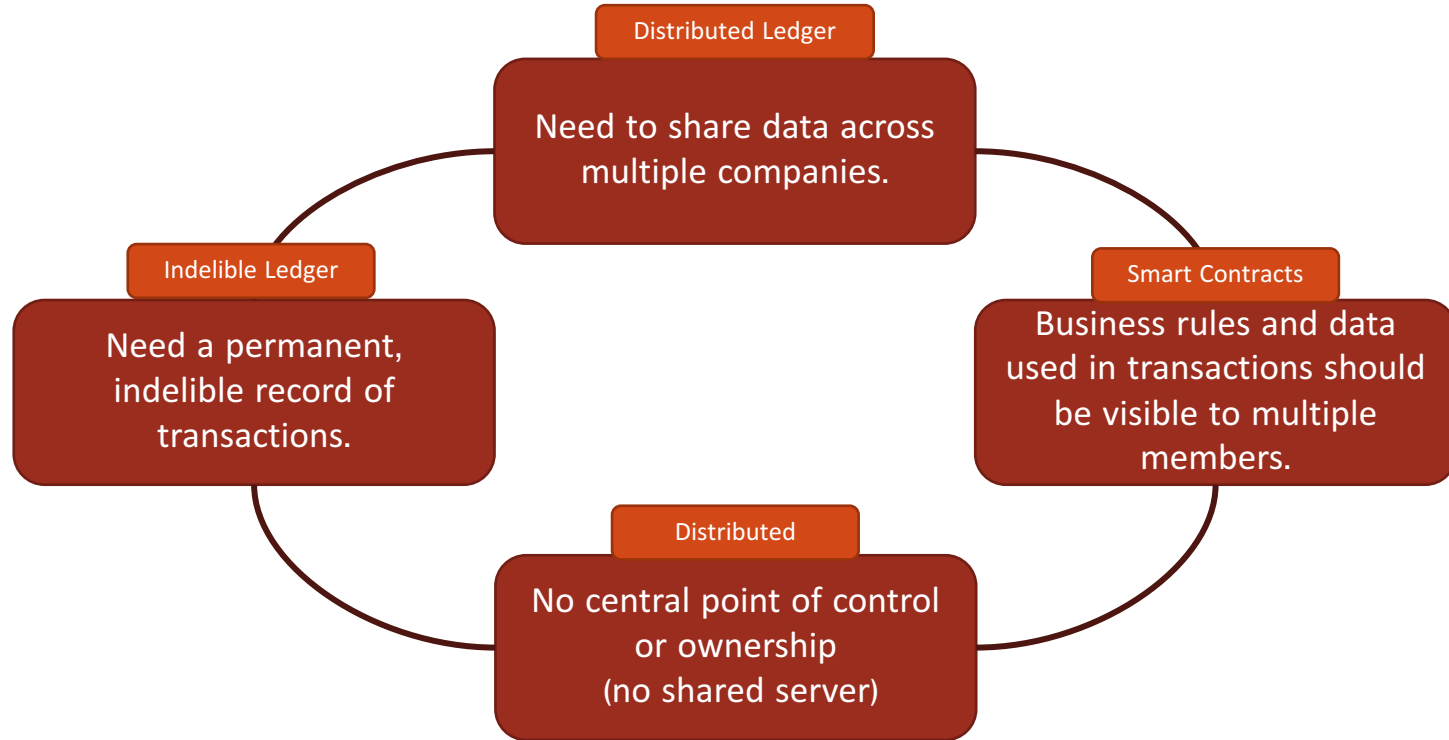
# INVOKING A BLOCKCHAIN TRANSACTION

<b>Peer</b>	Individual nodes in a fabric.
<b>Fabric</b>	Collection of nodes



- 1 Application invokes a transaction and passes data
- 2 Transaction data is replicated to the validating peers in the blockchain fabric
- 3 Peers pass transaction data to local chaincode program and run it. Chaincode programs are currently written in the language Go. Currently writing chaincode is very custom.
- 4 Peer can store state information in the World State local database.
- 5 Consensus algorithm runs and compares results across the peers. If > 50% of the peers agree, the changes to the world state database will be committed.
- 6 Data passed to the Transaction is "locked" into a new block in the chain. Transactions are gathered into time windows for writing to the blockchain (default is 1 second).

# ATTRIBUTES OF A GOOD BLOCKCHAIN USE CASE



If the data is only used by one organization - it's probably not a good use of blockchain.

# FRESH TURF - LOGISTICS



## Traditional Delivery

- Missed deliveries
- SGD 5 - 20 per package missed
- Delayed updates
- Consistent customer dissatisfaction

## IBM Blockchain Pilot Seeks to Solve 'Last Mile' of Delivery

Stan Higgins (@mpmcsweeney) | Published on October 24, 2016 at 17:37 GMT NEWS



IBM is working with a Singapore startup to develop a network of storage lockers connected via blockchain.

FreshTurf is looking to apply the tech to track delivery shipments, with dedicated storage lockers linked up through a distributed ledger platform. According to the [two firms](#), the project is aimed at creating a network of these lockers throughout Singapore, with the goal of providing a "last mile" solution for consumers looking to keep track of their packages more easily.



The project is an early one to emerge from IBM's BlueMix garage, a global network of innovation hubs that provides a foundation for startups and existing companies to experiment with blockchain and other technologies. The BlueMix network forms part of IBM's [broader strategy](#) for blockchain applications.



## FreshTurf Co-Founder - Jarryl Hong

“During the Design Thinking workshop, we had access to technical expertise, consulting and guidance through working with the IBM Bluemix Garage which allowed us to quickly build our concept. The IBM Bluemix Garage's methods of Design Thinking, use of cloud and agile development practices served as the foundation of our startup...it all added up for us”



FreshTurf app interface

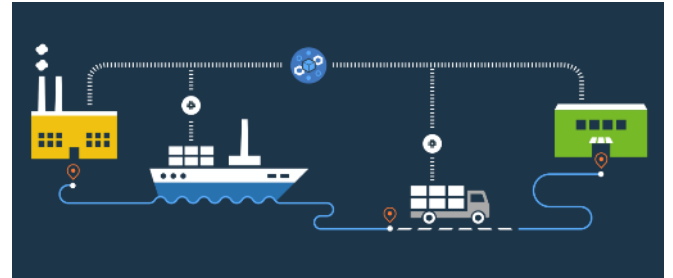
# IBM WATSON IOT PLATFORM & IBM BLOCKCHAIN IMPROVE SUPPLY CHAIN

## Scenario

- Goal is to improve intermodal container routing optimization
  - Systems between various supply chain parties do not communicate well with each other
  - Individual operator's optimization along the supply chain often cause problems further downstream
  - Many companies view overhead of logistics as the cost of doing business

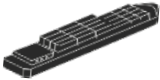
## Solution

- Utilize IBM solution to ensure flow of routing information and enrich it with 3rd party situational data such as weather or traffic info to all involved parties
- Potential cost savings of hundreds of millions of dollars



# EXAMPLES OF IOT USE CASES

Industry	Use Case(s)	Shared Data	Parties
Shipping / Logistics	<ul style="list-style-type: none"> <li>Monitor shipping logistics</li> <li>Share shipping documents</li> </ul>	<ul style="list-style-type: none"> <li>Location</li> <li>Cargo properties (temp, humidity)</li> <li>Shipping docs (bill of lading, letter of credit, customs forms)</li> </ul>	<ul style="list-style-type: none"> <li>Sender, receiver, freight companies, customs, bank</li> </ul>
Part Lifecycle Tracking & Maintenance	<ul style="list-style-type: none"> <li>Track part provenance from manufacture to end of life.</li> </ul>	<ul style="list-style-type: none"> <li>Part identification</li> <li>Usage information</li> <li>Maintenance information</li> </ul>	<ul style="list-style-type: none"> <li>Part manufacturer, final assembly manufacturer, repair organization, owner, regulatory agency</li> </ul>
Supply Chain	<ul style="list-style-type: none"> <li>Broadcast supply and demand on a shared blockchain.</li> <li>Track part location and manufacturing information on a shared blockchain.</li> </ul>	<ul style="list-style-type: none"> <li>Demand request</li> <li>Supply volumes</li> <li>Part provenance (ID, expiration date, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>Supplier, manufacturer</li> </ul>
Regulatory Compliance	<ul style="list-style-type: none"> <li>Share documents with a regulatory agency and or the public on a blockchain.</li> </ul>	<ul style="list-style-type: none"> <li>Compliance documentation</li> <li>Usage and maintenance information.</li> </ul>	<ul style="list-style-type: none"> <li>Regulatory agency, appropriate industry manufacturers and operators</li> </ul>
Building Management	<ul style="list-style-type: none"> <li>Permanent record of building access and usage</li> </ul>	<ul style="list-style-type: none"> <li>Log of building systems (A/C, lighting, alarms)</li> <li>Human access</li> </ul>	<ul style="list-style-type: none"> <li>Building owner, building tenant, building management, etc.</li> </ul>
Energy	<ul style="list-style-type: none"> <li>Track and trade carbon credits on a blockchain.</li> </ul>	<ul style="list-style-type: none"> <li>Carbon credits and carbon production.</li> </ul>	<ul style="list-style-type: none"> <li>Members of the carbon credit exchange, public.</li> </ul>



# Linux Foundation's Hyperledger Project

- Linux Foundation project announced December 17, 2015 with 17 founders, now 70 members
- The Hyperledger Project is a collaborative effort to advance Blockchain technology by identifying and addressing important features for a cross-industry open standard for distributed ledgers that can transform the way business transactions are conducted globally
- Open source and open standards-based

Enable adoption of shared ledger technology at a pace and depth not achievable by any one company or industry

## QUICK FACTS

Chairman	Blythe Masters/DAH
Executive Director	Brian Behlendorf
Technical Chair	Chris Ferris/IBM
IBM Contribution	44,000 lines of code in February 2016; Premier Sponsor
Sprint to one codebase with unified thinking	Target 3Q release

[www.Hyperledger.org](http://www.Hyperledger.org)



# IBM BLOCKCHAIN / HYPERLEDGER FABRIC

An open source blockchain platform focused on the needs of Enterprise blockchain users:

1. Faster transaction rates
2. Enterprise security
  1. Track identity of transactions
  2. Encrypted blockchain
  3. Future – Use encryption to control read access
3. Pluggable consensus algorithm
4. Can be hosted by IBM
  1. CA for blockchain identity
  2. Bluemix environment for developers
  3. Z Series environment for maximum security (LinuxOne)

# IBM Watson IoT and Blockchain

View a demo or engaged with Watson IoT Lab services by visiting [ibm.com/iot/blockchain](https://ibm.com/iot/blockchain)

IoT News > Private Blockchain >

## Explore Watson IoT with Blockchain

Share your IoT data in a secure private blockchain. Get started with Watson IoT Platform today.

Kick-start your blockchain project



Thank You