

Solution Brief

# Trusting the transaction of things: IoT and blockchain intersect



**Watson IoT**<sup>™</sup>

**IBM**

With all of the buzz around blockchain technology supporting a new generation of transactional applications, you may be wondering what blockchain means for you. You've heard that blockchain can establish trust, accountability and transparency while streamlining business processes. But what does it really do? Where is the relevance to your business? How do you get started? Now let's throw in an additional element to contemplate...where does blockchain intersect with your current or planned strategy for the Internet of Things (IoT)?

We will get to all of that, but first, let's talk about blockchain in general. Blockchain as a technology gained visibility with the crypto-currency platform, Bitcoin. In that case, the application was finance related and the set of participants could buy and sell using bitcoins. Now, with blockchain technology, the use cases have expanded across industries where various parties or entities want to participate in a secure, shared ledger. Because all participants can see the status of transactions, this eliminates the need to rely on some party to be trusted by every other participant to verify the transactions. In the blockchain, the combination of the shared ledger and smart contract implement agreed-to business rules for each transaction that allow that transaction to be trusted. This unbiased "truth" greatly reduces conflict resolution and handling of disputes.

Each node, or peer, in a blockchain fabric receives a copy of the indelible ledger and runs an identical copy of the smart contracts when transactions are approved. This is performed without a centralized authority. Because each party in the blockchain business network can view the data and business rules permissioned to them, the parties can trust the transaction record in the blockchain. Today, the blockchain ledger can be used to track and trade virtually anything without requiring a central point of control. This is where it becomes even more interesting in the context of IoT.

## The intersection of blockchain and the Internet of Things (IoT)

As the internet of things continues to grow at a rapid rate, its sensors and devices are becoming more commonplace to communicate information about the status of "things". With its new blockchain integration, the IBM Watson IoT™ Platform enables devices to send data from these things to private blockchain ledgers for inclusion in shared transactions with tamper-resistant records. Blockchain's distributed replication allows business partners to verify each transaction, so there's no longer a need for central control and management. The blockchain records what each participant does and everyone is accountable in the overall transaction.

### Within an IoT construct, blockchain can:

- **Build a trusted and efficient business network** between the people and parties that transact together. Devices can participate in transactions as a party which invokes transactions in the blockchain. 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 of creating, maintaining and enforcing contracts** by sharing information amongst multiple parties. Transactions and device data are now exhibited on a peer to peer basis. A peer is a node in a Hyperledger that contains a copy of the ledger. Consensus is performed to agree on the state of the blockchain shared ledger.
- **Produce a permanent or indelible record** required for industry and government regulations.
- **Accelerate transactions** for improved customer service and **enable new business models**.

### What this means to your business

Leveraging blockchain for your IoT data opens up new ways of automating business processes among your partners without setting up an expensive centralized IT infrastructure. The transaction validation blockchain provides ensures faster resolution of breached contracts, stronger working relationships with your partners, and greater efficiency as partners learn they can rely on the information provided.

### IBM's investment and commitment to blockchain and open standards

Using the Watson IoT Platform, IBM makes it possible for groups of participating parties to use information from Internet of Things (IoT) devices, such as geo-location, with smart contracts running on the IBM Blockchain networks or fabric. Does this mean that all participants in the blockchain have to have an IoT infrastructure? No, it can be as simple as one participant using the data from IoT devices.

The IBM Watson IoT Platform allows devices to participate in blockchain transactions, communicating to blockchain-based ledgers to invoke transactions defined by the smart

contract. It also provides data mapping between the data format in the devices' messages and the data format required by the contract. These transactions update information in the ledger. The smart contract helps define many of the terms that the parties agree to follow. These smart contracts can even signal additional actions outside of the blockchain, like ordering a replacement part or placing a service call.

IBM Blockchain differs from other blockchains in that it was designed from the ground up to meet the needs of the enterprise. The IBM Blockchain fabric uses the Linux Foundation's Hyperledger open source project as their basis. The Hyperledger Project is a collaborative effort between more than 40 members. The goal is to advance blockchain technology through cross-industry open standards for distributed ledgers. As part of their commitment to the Hyperledger Project, IBM donated 44,000 lines<sup>1</sup> of code in February 2016.

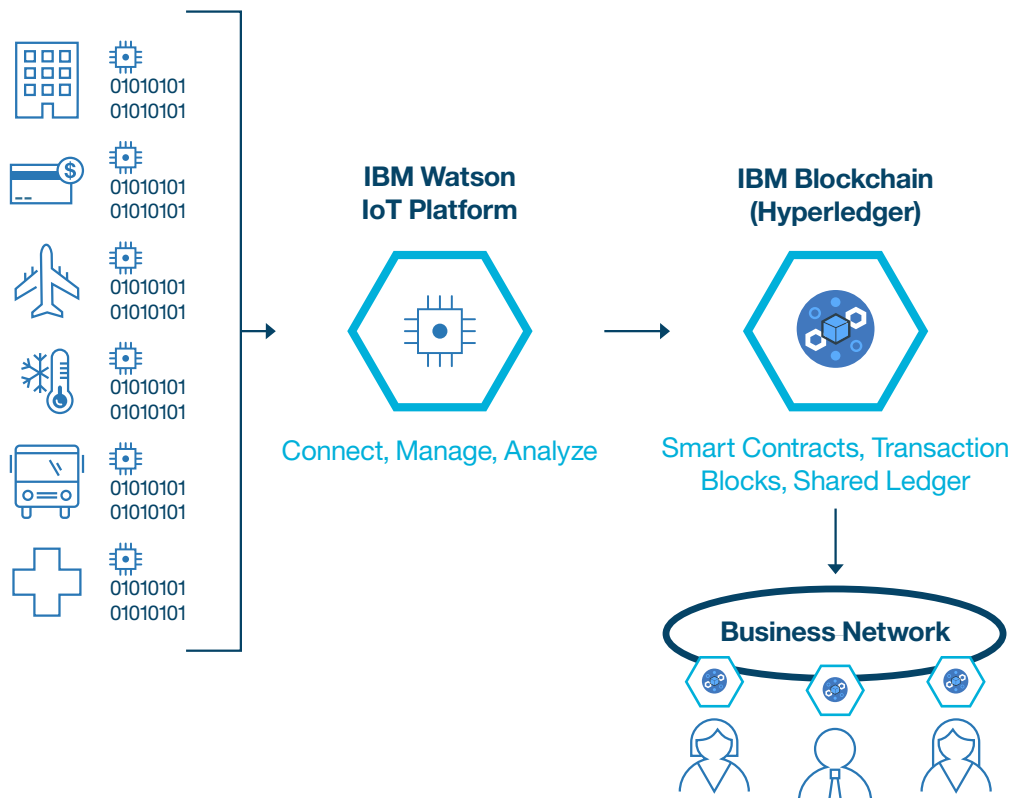
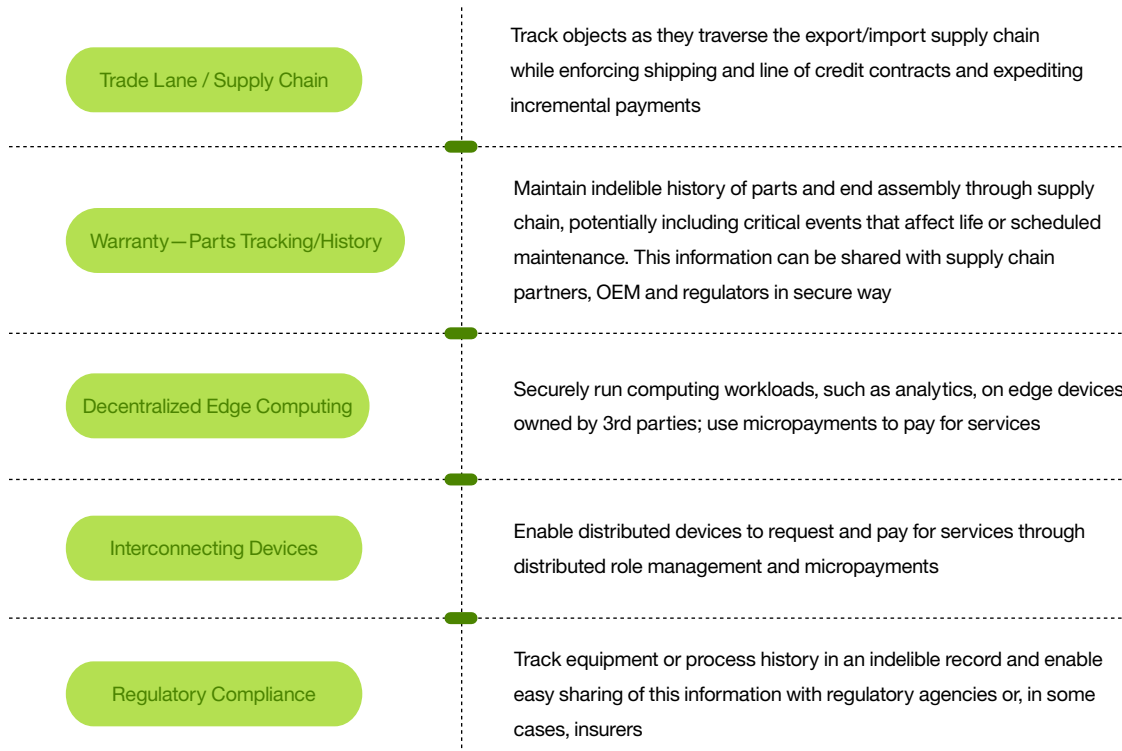


Figure 1: The IBM Watson IoT Platform takes information from sensors and devices and communicates it to the blockchain ledger where it can be accessed by members of the business network.

## Use cases for IoT and blockchain

If you're still asking yourself whether IoT and blockchain is right for you, do you have current scenarios that involve agreements among a group of parties which have a need to share information? Are you trying to track or trade something of value where multiple parties have a vested interest?

Here are some examples that are unique to the Internet of Things.



Let's take a more in-depth look at two illustrations where blockchain and IoT have the potential to change existing business processes.

## Use IoT and blockchain for supply chains

An IoT device could be used in many different ways as part of a supply chain. For example, a temperature sensor could be embedded in a package to track the temperature throughout the shipment process. It stores the data locally and sends it to the private blockchain through the Watson IoT Platform at numerous waypoints (factory, depot, grocery store) upon receiving connectivity.

### **Business value of blockchain for supply chains**

Using blockchain for this transaction allows all business partners to access the same temperature data without requiring central control. A business rule could have been triggered in real time to:

- Alert the factory that the shipment had arrived at the grocery store
- Automatically trigger payments to be made by the factory to the carriers
- Automatically generate an invoice to be sent to the grocery store

Play with our IoT and blockchain demo to see some more detailed illustrations of the supply chain and IoT and blockchain use case: <http://ibm.co/iot-blockchain>

### **Use IoT and blockchain for asset management and part tracking**

An embedded sensor can provide an indelible history of parts from manufacture and assembly through the supply chain, potentially including critical events that affect life or scheduled maintenance. This information can be shared with supply chain partners, OEM and regulators in secure way.

There are two challenges to maintaining something with life limited parts. The first is that each component of a complex system can be difficult to track. Manufacturer, production date, batch number and the manufacturing machine program are not always known. Second, without a standard record detailing where the part came from and how it is currently being used and maintained, unnecessary or overdue maintenance may occur.

A shared IoT and blockchain ledger maintains a record for usage, maintenance, warranty work and replacement parts. In the case of a recall situation, it can pinpoint specific batches of parts that may fail rather than require a broad retraction.

### **Business value of blockchain for maintaining life-limited parts**

You can achieve greater transparency of true history when you have proof of good parts, completed maintenance and certifications, and clean documents. This also increases confidence and safety because replacement part origin and all service are indelibly recorded. And insurers, lenders, and warranty service providers can recognize new business opportunities.

### **Getting started with blockchain in an IoT context**

The experts in our IBM Watson Internet of Things (IoT) Lab Services organization will partner with you to explore the potential of IoT and blockchain in your business and define and implement your first blockchain project.

### **Want to learn more?**

To learn more, visit <http://ibm.co/iot-blockchain>

Footnotes

1. <http://www-03.ibm.com/press/us/en/pressrelease/49029.wss>

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