Blockchain and the Internet of Things in the Industrial Sector

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Blockchain and the Internet of Things (IoT) are key technologies that will have a huge impact in the next 10 years for companies in the industrial market. This article describes how these two technologies will improve efficiencies, provide new business opportunities, address regulatory requirements, and improve transparency and visibility. The IoT allows for real-time capture of data from sensors. As the price of sensors and actuators keeps falling, companies in the industrial sector will be able to overcome cost obstacles in adopting IoT platforms. Blockchain will enable the sharing of key relevant data captured from the IoT using a distributed, decentralized, shared ledger that is available to participants in the business network.

SUPPLY CHAIN SOLUTIONS

Supply chain use cases are the most common application of blockchain for solving real business problems due to the lack of visibility of shipment data for product or component information as the shipment moves through the supply chain. Shipment delays are often due to intermediaries within the supply chain whose role is approval of paperwork associated with the shipments. Paperwork has a tendency to get misplaced or lost, or is awaiting processing as the piles of paperwork grow. What if this paperwork could be digitized on the blockchain? The need for these types of intermediaries could be removed from the supply chain.

The blockchain would capture key shipment data emitted from IoT devices attached to products or components as the shipment moves from source to destination. The IoT platform would invoke a transaction for the blockchain that contains the shipment container location and timestamp. The transactions captured in the blockchain would serve as proof of shipment and proof of delivery for container shipments. Shipment delays would be minimized and lead times for materials flowing to manufacturing facilities could be more accurately predicted. Inventory levels at the facilities could be better aligned with just-in-time practices.

In Figure 1, location data is captured by IoT sensors that forward the data to an IoT platform. The IoT platform captures location data in the blockchain. Participants in the supply chain in-

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clude original equipment manufacturers (OEMs), suppliers, third-party logistics providers, shippers, and warehouses. Each participant has visibility to pertinent shipment data in the blockchain based on the participant's role. Logistics management systems are used by manufacturers to query the blockchain for shipment data and provide additional shipment information to the blockchain.

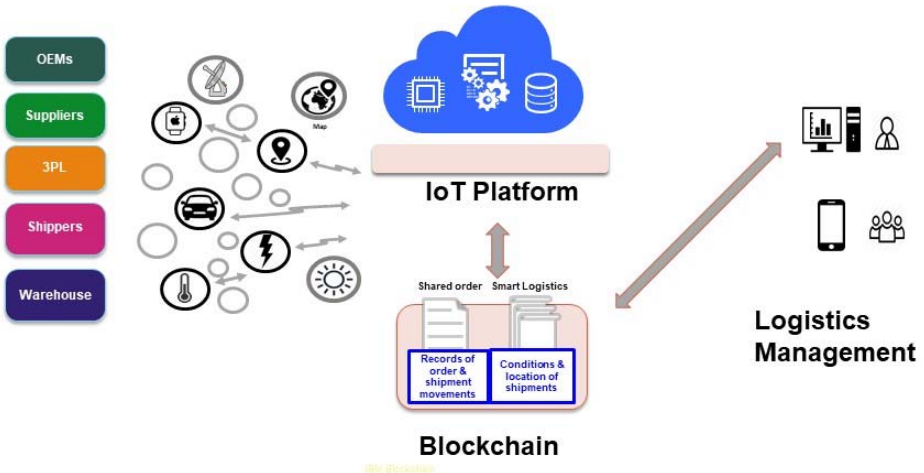

Figure 1. Blockchain and Internet of Things (IoT) supply chain solution. OEMs: original equipment manufacturers; 3PL: third-party logistics.

AUTONOMOUS VEHICLE SOLUTIONS

According to a study of the top global automakers, we will see a significant number of cars with some self-driving capacity by the early 2020s, with the first cars mostly being luxury cars or part of commercial fleets.[1]

What if a vehicle was totally autonomous in every sense of the word? A vehicle could drive itself to refuel or to an electric charging station. Connected car solutions would benefit from a blockchain and IoT solution due to more timely and visible data captured in the blockchain from vehicle sensors. If sensors on the vehicle detected a repair was needed, the vehicle could automatically schedule an appointment and drive to a repair facility. Autonomous vehicle manufacturers would have timely access to engine or power train failure information captured on the blockchain and could use this information to determine if failure trends are occurring for the component.

Customers benefit from the increased level of care from the manufactures and increased consumer confidence. Manufacturers, regulators, and suppliers would have appropriate visibility into component failures on the blockchain and could proactively react to failure trends more quickly to ensure consumer safety and satisfaction. The vehicle would securely pay for refueling or repairs automatically without direct human intervention. A permanent record of the refueling, repairs, and payments would be recorded on the blockchain and shared by participants including vehicle owners, manufacturers, repair facilities, and financing firms.

Figure 2 illustrates vehicle sensors emitting data to the IoT platform such as fueling, charging, parking, and repair events. The IoT platform invokes the appropriate blockchain transaction based on rules tied to the type of received sensor data. An open API integration layer is used by

the refueling, charging, parking, or repair facilities to invoke a transaction on the blockchain when the operation is complete.

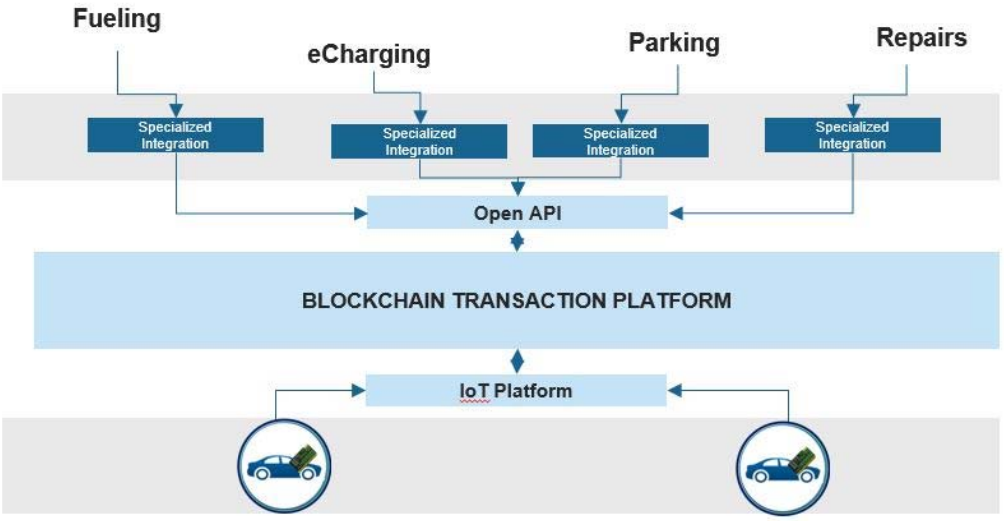

Figure 2. Blockchain and IoT autonomous vehicle solution.

MANUFACTURING PLANT ASSET MANAGEMENT

A blockchain and IoT solution would enable the prevention and prediction of failures for manufacturing plant equipment. Equipment sensors would detect conditions such as excessive vibration or heat, which might lead to failures or operator injury. Key threshold data captured on the blockchain from the sensors would be used to detect trends for these failures and facilitate proactive maintenance and repairs before the failure occurs. The application of analytics and cognitive data generated from the equipment on the factory floor would enable reliability, maintenance, and operations personnel to gain more detailed, accurate insight into asset performance. Regulators and suppliers of plant equipment would have visibility into equipment records and could provide timely inspections and certifications to ensure equipment reliability. Third-party repair partners could monitor the blockchain for preventive maintenance and record their work on the blockchain.

CONCLUSIONS AND IMPLICATIONS

Blockchain and IoT solutions in the industrial sector will need to address regulatory, legal, and insurance requirements for goods transferred on the supply chain, autonomous vehicles, and manufacturing plant equipment. Safety records and test results will need to be closely monitored by regulators, insurance adjusters, and legal institutions. Regulators will need access to compliance and safety records in the blockchain. Insurance adjusters will be interested in safety records as well as equipment failures for risk analysis. Law firms will need access to safety records and equipment failure data from the blockchain for litigation. IoT sensor devices and the IoT platform will need high availability and scalable solutions to handle transaction volumes and five nines uptime requirements. There will be high liability concerns from insurers of autonomous vehicles, and insurance premiums will initially be expensive until the technical framework and safety records for autonomous vehicles has matured.

Despite these implications, the combination of blockchain and the Internet of Things (IoT) will bring business value to the industrial sector.

REFERENCE

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