
Cyber-Physical Chain (CPChain) Light Paper

Decentralized Infrastructure for Next Generation

Internet of Things



CPChain
CYBER PHYSICAL CHAIN

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Abstract

Deeply integrating blockchain and Internet of Things (IoT) technologies, Cyber-Physical Chain (CPChain) builds new generation distributed IoT system architecture with decentralized and trustworthy characteristic. CPChain aims to reduce the cost of system connectivity, increase the value of open data sharing and ensure user privacy and system security for IoT.

CPChain focuses on the scalability, security and real-time problems of the application of blockchain technology to the IoT industry. Combining the three technologies of blockchain, IoT and distributed encryption storage and computing, CPChain construct a new generation of IoT architecture, which provides a full process solution for data acquisition, storage, sharing and application in the IoT industry.

CPChain is focused on multiparty data transactions and artificial intelligence decision applications based on big data analysis. By establishing multi-party trust and realizing the interconnection of heterogeneous data, it solves the typical problem in traditional IoT industry. Furthermore, we can create an innovative business model for new generation of data sharing on CPChain.

Existing IoT bottleneck problems

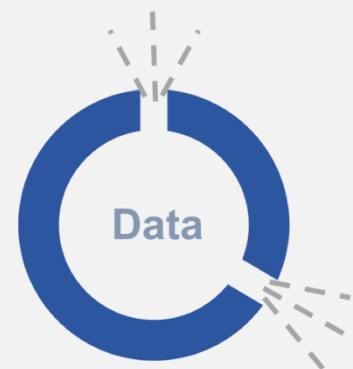
1. Cost. The centralization characteristics of the current IoT system causes the problem of poor interoperability and high interconnection cost among devices and IT systems.



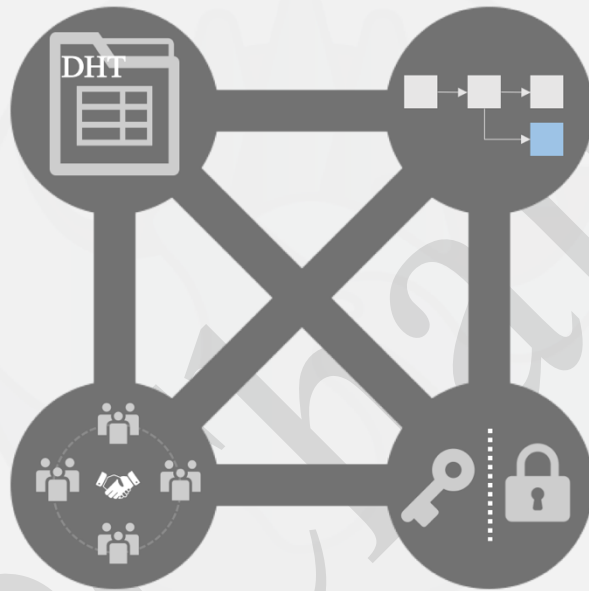
2. Isolability. The traditional IoT architecture is a proprietary structure for specific application scenarios, which is likely to result in isolated data island. Moreover, the data value cannot be fully utilized.



3. Privacy and Security. Privacy leakage and cyber attack are frequent reported recently on IoT, which shows that users' privacy data and system security are not well protected.



Deeply integration of Blockchain technology and IoT technology



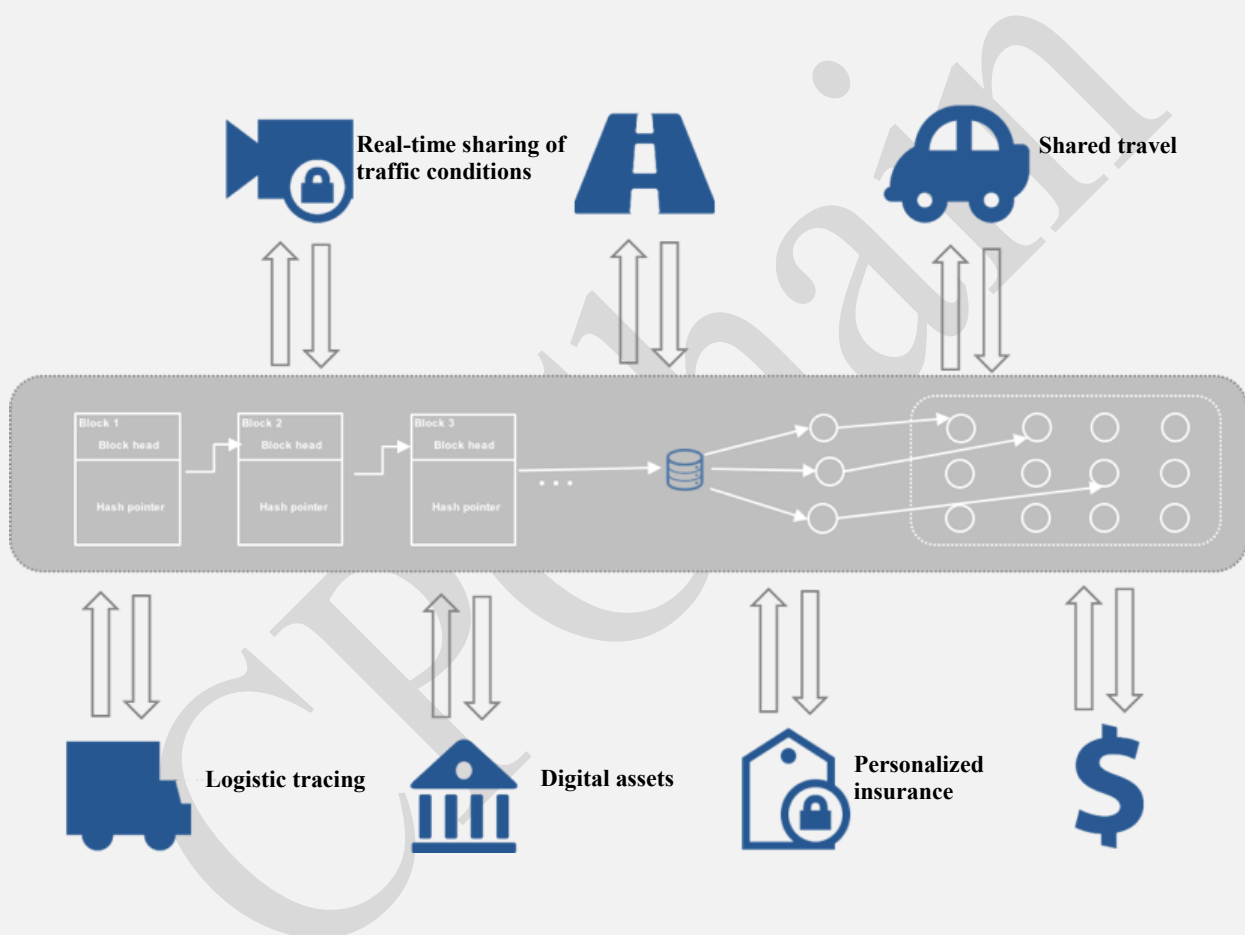
CPChain will overcome the bottleneck problems in the current IoT system by considering four critical technologies, which include distributed cloud storage, data security cryptography, blockchain technology, and large-scale distributed network consensus protocol.

- 1. A decentralized system is built by integrating with blockchain technology to guarantee that the data on the chain is permanently valid and untamper-proof. It provides**

verifiability and traceability for various IoT application.

2. **A novel technology of combining cryptography and distributed hash table (DHT) is proposed** to solve the scalability problem of the data storage in traditional blockchain.
3. **A highly efficient distributed consensus protocol is designed** to encourage users participation and promote the cooperation of all parties involved in the system.
4. **Both re-encryption and homomorphic encryption technologies are implemented** to guarantee the operation of the system, protect users' privacy data, and further enhance the confidence of users.

Interconnection of different industries



CPCChain provides a basic data platform, by which different industrial IoT systems are effectively connected and different industry data can be intelligently interacted. Taking the traffic data as an example, CPCChain provides a comprehensive process solution for optimization of traffic scheduling, customization of vehicle's

personalized insurance, routing optimization of vehicle navigation and driving assistance, etc.:

1. Transport video data—>CPChain data platform—>Big data analysis—> optimization of traffic scheduling
2. Users' driving record—> CPChain data platform—>Big data analysis—> customization of vehicle personalized insurance

In terms of the IoT-data-based artificial intelligent decisions, taking electric vehicles as an example, the CPChain data platform can obtain sensors data of all kinds of key equipment of electric vehicles and battery charging/discharging to realize the predictive maintenance of electric vehicles. Moreover, combining with travel data and charging pile data, CPChain can establish a shared travel and charging platform for electric vehicles, which enables our green and economic travel.