TPEC | TRANSPORTATION POLICY AND ECONOMIC COMPETITIVENESS PROGRAM

Blockchain: A Disruptive Technology for Transportation?

Blockchain is a decentralized, distributed, and public digital ledger used to record transactions among various computers. It also is a potentially disruptive force for various aspects of transportation. TPEC researchers are exploring blockchain and its implications for industries, supply chains, and government agencies.

WHAT IS BLOCKCHAIN?

At its most basic level, a blockchain is a chain of blocks; each block contains digital information.

Blockchains are continuously growing lists of transactions linked together with a cryptographic "hash" (or unique code) of the previous block and a timestamp of the transaction. This distributed ledger is normally managed by a peer-to-peer network that abides by a protocol. This protocol defines the mode of mutual communication and the validation of new blocks to assure transparency and permanency.

Each computer in the blockchain network has its own copy of the blockchain, which means there could be thousands, or even millions, of copies of the same blockchain. Because of this, transactions cannot be hacked or changed if any one computer or system is compromised—a hacker would need to manipulate every copy of the blockchain.

Blockchain is the underlying technology for Bitcoin, a form of digital cash or cryptocurrency. Users can exchange Bitcoin without intermediaries or oversight from a central bank. Bitcoin's value has gyrated between zero to more than $17,000 in late 2017, and to around $3,500 in early 2019.

A number of companies, industries, and countries are also experimenting with blockchain.

INDUSTRIES USING BLOCKCHAIN

Financial institutions and shipping fleets are experimenting with blockchains to create blockchain-based contracts to reduce time and cost. Clearinghouses and custody providers of other financial contracts are also exploring blockchain to do clearing and settlements more quickly while enhancing security.

Walmart, Unilever, Dole, and Nestlé are some of the major food companies partnering with IBM to explore how to use blockchain in their food supply chains. One of the goals is to improve the traceability of their fresh fruits and vegetables. It is hoped that this will allow them to pinpoint the source of contamination in a very timely manner. In late 2018, Walmart announced that it is requiring its leafy greens suppliers to start using IBM-based blockchain staring in early 2019.

The automobile industry is heavily involved with blockchain technology. Manufacturers, OEMs, financial institutions, and communication companies are looking at automobiles as a communication hub not only for transportation purposes but also for financial transactions. Manufacturers such as Toyota are initially exploring blockchain as a financing tool and may later expand its use for supply chain management, connected vehicle systems, and tolling systems.

SUPPLY CHAINS

FedEx's CEO stated that blockchain is the next frontier for global supply chains and that failure to engage in the technology probably means extinction. FedEx is partnering with leading freight, shipping, and logistics companies to develop and implement blockchain through the Blockchain in Transportation Alliance (BiTA).

EUROPEAN INITIATIVES

The European Parliament created a pilot project, the EU Blockchain Observatory and Forum, to monitor blockchain initiatives. The project is being run by a partnership of consultants and universities. In addition, hundreds of proof-of-concept and research initiatives are under way in Europe.

PROPOSED TPEC RESEARCH

TPEC researchers believe blockchain has potential for various aspects of the automotive and transportation world. We would like to further study how blockchain may apply to Mobility-as-a-Service, supply chains, vehicle tracking, and the Automotive Internet of Things. We would like to explore whether blockchain can be an answer to security concerns with automated and connected vehicles and for mileage-based tax collection systems.

We also want to study the challenges faced in the implementation of blockchain. There is some concern about the ability of blockchain to handle massive data and energy requirements. Another concern revolves around privacy. Blockchain initially started as an open, permissionless, public network to break away from the control of central authorities. To overcome some of the challenges of handling massive amounts of data, there is a movement to create permissioned (private) blockchain. As the name indicates, this particular blockchain has an overlay that limits access to the blockchain either by an entity or group of entities. While it overcomes some of the challenges of blockchain, it creates its own issues. While studying blockchain for transportation, we would like to explore this particular issue as well.

FOR MORE INFORMATION AND ADDITIONAL ANALYSES

TPEC welcomes public engagement and encourages you to contact us with your questions, comments, and research needs.

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