# Researchers use blockchain to drive electric-vehicle infrastructure

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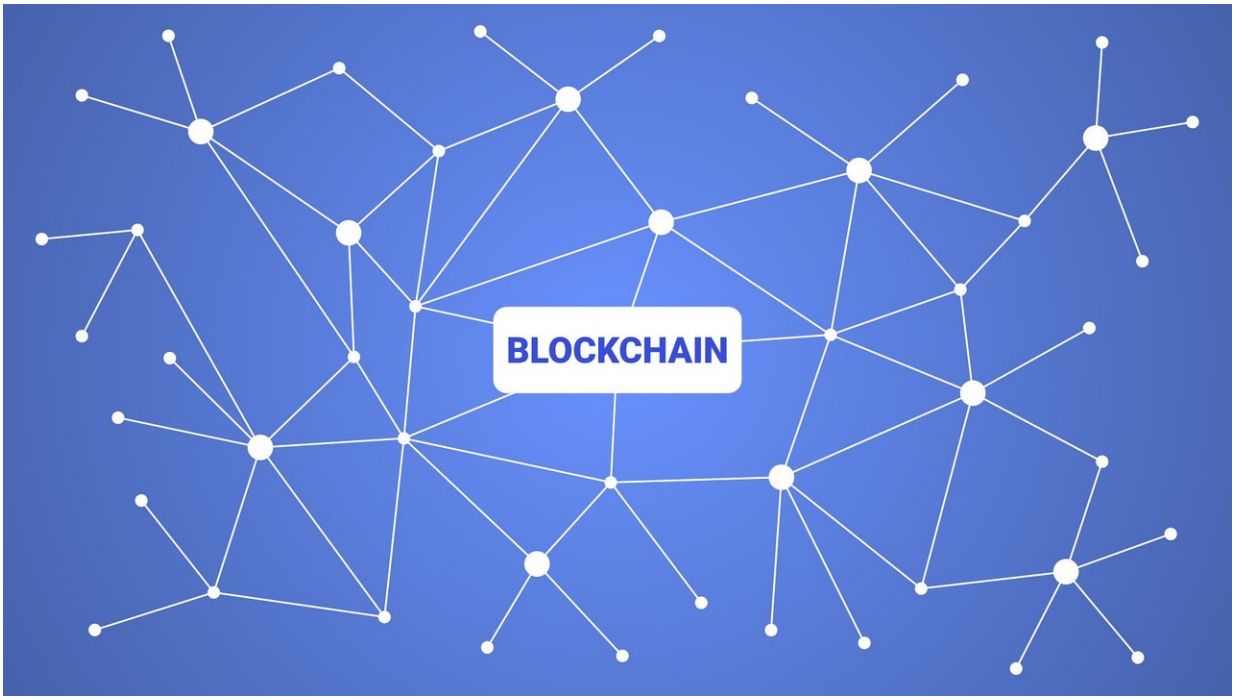


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Researchers at the University of Waterloo have integrated the use of blockchain into energy systems, a development that could result in expanded charging infrastructure for electric vehicles.

In a study that outlines the new blockchain-oriented charging system, the researchers found that there is a lack of trust among charging service

providers, property owners and owners of electric vehicles (EVs).

With an open blockchain platform, all parties will have access to the data and can see if it has been tampered with. Using a blockchain-oriented charging system will, therefore, allow EV owners to see if they are being overcharged while property owners will know if they are being underpaid.

"Energy services are increasingly being provided by entities that do not have well-established trust relationships with their customers and partners," said Christian Gorenflo, a Ph.D. candidate in Waterloo's David R. Cheriton School of Computer Science. "In this context, blockchains are a promising approach for replacing a central trusted party, for example, making it possible to implement direct peer-to-peer energy trading."

In undertaking the study, Gorenflo, his supervisor, professor Srinivasan Keshav of the Cheriton School of Computer Science, and Lukasz Golab, professor of Management Science, collaborated with an EV-charging service provider. The provider works with property owners to install EV supply equipment that is used by EV owners for a fee. The revenue stream from these charging stations is then shared between the charging service provider and each property owner. The EV supply equipment is operated by the charging service provider, so the property owners must trust the provider to compensate them fairly for the electricity used.

From the case study, the researchers were able to identify three steps necessary for the incorporation of blockchain technology into an energy system. The first is to identify the involved parties and their trust relations. If the level of trust in a relation is insufficient to achieve the application's goal or if it restricts an action necessary to reach that goal, this should be recorded as a trust issue.

Secondly, design a minimal blockchain system, including smart contracts, that resolves the trust issues identified in the first step. If parts of a legacy system need to be replaced, the new system should closely mimic existing interfaces so that dependencies can continue to work with minimal modifications.

Finally, with the trust-mitigating blockchain in place, the rest of the system can be migrated iteratively over time. This allows the business model to eventually grow from a legacy/blockchain hybrid into a truly decentralized solution.

"Mitigating trust issues in EV charging could result in people who have charging stations and even those who just have an outdoor outlet being much more willing to team up with an EV charging service provider resulting in much better coverage of charging stations," said Gorenflo.

"In the end, we could even have a system where there is machine-to-machine communication rather than people-to-machine. If an autonomous vehicle needs power, it could detect that and drive to the nearest charging station and communicate on a platform with that charging station for the power."

The study, Mitigating Trust Issues in Electric Vehicle Charging using a Blockchain, authored by Waterloo's Faculty of Mathematics researchers Gorenflo, Keshav and Golab from the Faculty of Engineering was published recently in the *Proceedings of the Tenth ACM International Conference on Future Energy Systems*.

Provided by University of Waterloo

https://techxplore.com/news/2019-08-blockchain-electric-vehicle-infrastructure.html