Technical Disclosure Commons

Defensive Publications Series

November 08, 2018

DECENTRALIZED PLATFORM FOR AUTONOMOUS ENERGY TRANSACTIONS IN A CONSTRAINED ENVIRONMENT USING BLOCKCHAIN

Yenu Gobena

Hazim Dahir

Nagendra Kumar Nainar

Rajiv Asati

Carlos M. Pignataro

DECENTRALIZED PLATFORM FOR AUTONOMOUS ENERGY TRANSACTIONS IN A CONSTRAINED ENVIRONMENT USING BLOCKCHAIN

AUTHORS:
Yenu Gobena
Hazim Dahir
Nagendra Kumar Nainar
Rajiv Asati
Carlos M. Pignataro

ABSTRACT

Techniques are described herein to enable any electric vehicle (or other vehicles capable of transporting and dissipating energy) to broadcast the availability of excess energy using any Vehicle-to-Vehicle (V2V) mechanism. Electric/fuel availability and other information may be propagated by leveraging peer-to-peer decentralized blockchain smart contracts that can be used in a connected electric vehicle environment.

DETAILED DESCRIPTION

As more and more mobile devices get connected (public or private network), the need for ad-hoc power consumption may continue to increase. For example, a connected battery-powered car XYZ may get low on power after about thirty minutes and be unable to arrive at its destination, thereby requiring on-demand ad-hoc power charging to get to its destination. It is possible that another battery powered car, solar-powered house, etc. (ABC) may have spare power before/around thirty minutes that could be offered to XYZ. If car XYZ agrees to any offers (such as the one from ABC) based on criteria such as proximity (current and future), quality (30mA vs 3000mA), quantity (30W vs 3000W), etc., then car XYZ could obtain the extra power at the right time, right proximity etc. to get to its destination.

Additionally, it is quite possible that both parties (taker XYZ and offerer ABC in the aforementioned example) may be mobile as well, and such transactions may therefore occur autonomously without needing to stop and/or connect wires. This example mentions a car, but it could be any device.

This necessitates a peer-to-peer decentralized marketplace platform that can allow for interested parties (offerer and taker) to find each other and to conduct transactions in a secured manner.

With the introduction of Internet of Things (IoT), smart grid, and smart cities, it is envisioned that the energy distribution and trading between users will reach a new level. As such, techniques described herein allows any electric vehicle (or other vehicles capable of transporting and dissipating energy) to broadcast the availability of excess energy using any Vehicle-to-Vehicle (V2V) mechanism.

This mechanism uses the concept of propagating electric/fuel availability and other information by leveraging peer-to-peer decentralized blockchain smart contracts that can be used in a connected electric vehicle environment.

As illustrated in Figure 1 below, blockchain may be used to maintain user information and the smart contract that can be used by other parties to ensure and validate the credibility of the party who is advertising the energy availability. The "Producer" is the party willing to provide the energy and the "Consumer" is the party who is receiving the energy.

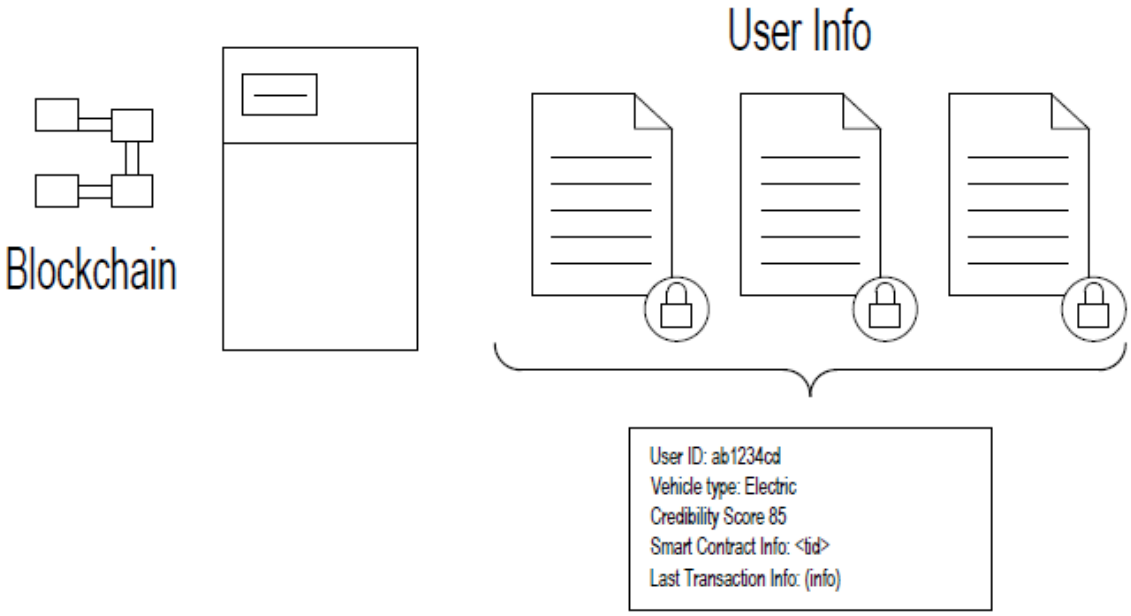

Figure 1

Each producer who is willing to participate in this marketplace may register their information in the blockchain. The use of blockchain serves at least two purposes. First, it

allows the Consumer to verify the credibility of the Producer before making a decision. Second, it allows the Consumer to update the blockchain with (successful) transaction details to augment the credibility of the Producer.

The blockchain includes all the relevant details about the Producer. For example, it can include the registered user Identifier (ID), type/make of vehicle, Vehicle Identification Number (VIN) details, credibility score, smart contract information, last successful transaction details, etc. Each Producer may also create a smart contract that involves all the financial related agreements.

Figure 2 below illustrates propagation of energy availability.

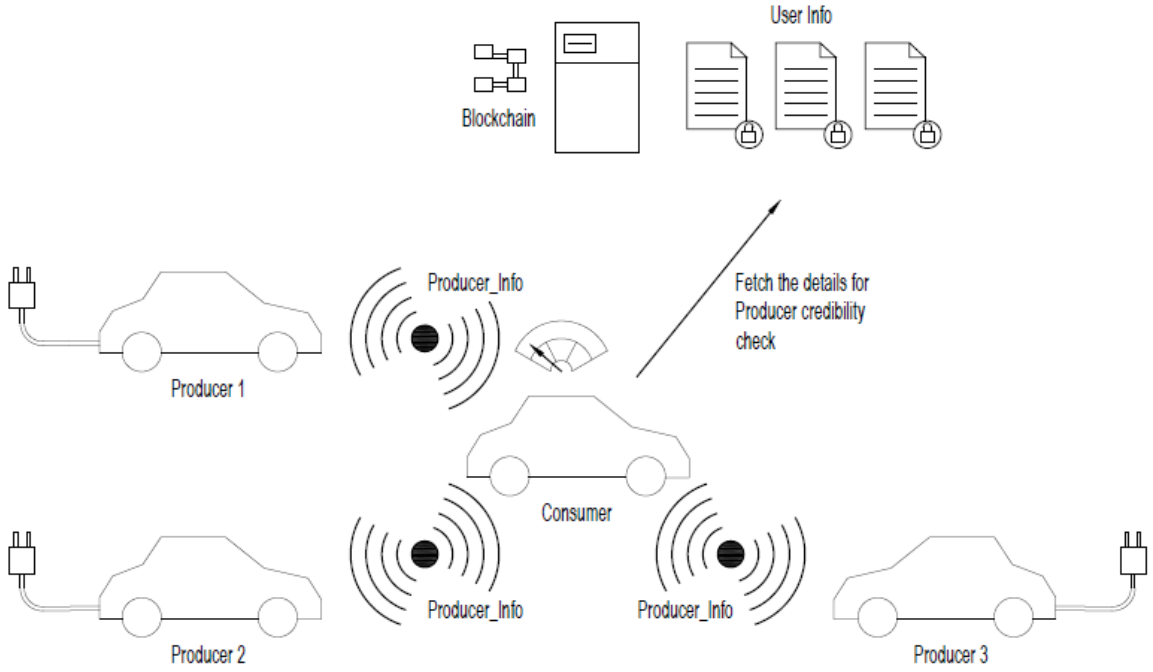

Figure 2

Each Producer may broadcast the energy availability and the blockchain details that can be used by the Consumer to perform the initial sanity check and validation. In one embodiment, this message is always broadcast by the Producer. In another embodiment, broadcast occurs on-demand. The on-demand basis is similar to a query-response where the Consumer broadcasts a request asking for Producers with energy availability and the Producers respond back with the above details. The broadcasted message may carry details such as geolocation of the electric vehicle, energy availability, proximity, smart contract information, etc.

In another embodiment, the Producer electric vehicle can construct an "energy path" which is the path taken by the electric vehicle towards the destination and propagates this through a central cloud entity to vehicles along the path. The current geolocation, proximity, duration of seller electric vehicle, etc. may be used by the buyer to detect whether the contract can be executed and the energy received on time.

Any Consumer that is in need of energy may leverage the details from the blockchain and choose a Producer based on certain logic. When more than one Producers are advertising availability, the Consumer can make a decision based on certain logic such as:

Priority 1 - Choose the Producer with whom the Consumer has already performed a similar transaction. If it is a tie;

Priority 2 - Choose the best Producer based on the credibility score. If it is a tie;

Priority 3 - Choose the Producer whose energy path most closely matches the Consumer's destination path. If it is a tie;

Priority 4 - Choose the Producer with the highest energy quantity. If it is a tie;

Priority 5 – etc.

Once the energy exchange is successful, the transaction details and the feedback score may be updated in the blockchain (about the Producer). This may help other consumers.

In summary, techniques are described herein to enable any electric vehicle (or other vehicles capable of transporting and dissipating energy) to broadcast the availability of excess energy using any V2V mechanism. Electric/fuel availability and other information may be propagated by leveraging peer-to-peer decentralized blockchain smart contracts that can be used in a connected electric vehicle environment.