School of Computing

Year 4 Project Proposal Form

Project Title: Delock (Rental System based on Blockchain)

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General area covered by project

My proposal is for a smart lock system based on the Ethereum Blockchain platform. An Ethereum network consists of series of smart contracts or autonomous digital entities that can talk to and transact with each other. These entities are based on blockchain technology so they benefit from its properties such as immutability i.e. a third party cannot arbitrarily change a smart contract on the network. All nodes on the network must agree before changes can take effect. Another advantage is the possibility for zero downtime due to the decentralized architecture of the system.

In essence, this system would allow everyday object to run code. The system would allow the renting and sharing of objects which were traditionally very hard to monetise effectively. The main implementation would be smart locks for equipment allowing people to rent objects to others who pay a deposit and unlock the object via Bluetooth using their smartphone.

Background

The idea for the system stems an article I read some time ago. A company was working on implementing a blockchain based system to allow owners of autonomous cars to send their cars out at night while they were sleeping to act as taxis for others, basically earning a person money as they sleep. This is a phenomenal idea and has countless applications in other areas.

Achievements

The system would be open to anyone who wants to avail of a good or service for short to medium terms, a person would have to verify their identity when signing up to the system.

Owners create a “profile” for their objects listing relevant details about the object which includes images and a description of the condition of the object as well as defining a deposit amount, rental price, availability and an acceptable drop-off radius upon return of the object. The owner locks the item with a specialised lock and they can then trust the object to manage itself from there on.

Potential renters open the Delock app, select an object they want to rent from a list. The app will then read the blockchain to find the smart contract related to the object selected by the user, when the user makes a payment they essentially pay the lock itself.
When the user arrives and tries to unlock the object, they pair with the lock via Bluetooth. The lock will then search the blockchain to find its own smart contract reference on the chain, it will then cross-reference data from the user with data stored on the blockchain. If the details match then the lock will disengage and the user can remove it.

The lock will disengage and the renter is then free to open/close that lock as many times as they want until they return the item. The user returning the item will also be processed and recorded as a block on the blockchain but interactions with the lock in between will just be simple and quick verification processes. When they return the item, the renters deposit is returned to them and they are debited the total rental cost. The owner then receives their payment from the user.

If renters keep the item outside the pre-agreed time frame then a surplus is added to the rental price depending on what terms the owner has set out.

Justification

A Use Case very much applicable to Ireland due to the size of the farming industry here would be the rental of farming equipment:

The Delock system would facilitate sharing of equipment between farm owners, as a result, small scale farmers get access to high quality equipment which in turn will increase yield from their crops and livestock, simultaneously the equipment owners have a new revenue stream and an effective means by which to monetise equipment that traditionally lay idle for much of the year.

Co-operatives and Plant hire business that already own fleets of equipment would benefit from Delock by handing the bulk of the management over to the equipment itself.

Delock would give small scale farm owners access to the best equipment and encourage others to invest in new equipment knowing they have a new stream of revenue to curb the cost.

With minimal adaptation, the system would cope with all kinds of other use cases, for proof of concept this project will deal primarily with bicycle locks.

Programming Languages

Android App

- Java
- Javascript (React Native)
- Ethereum Android

Arduino

- C++ client

Learning Challenges

- Running a blockchain client on a phone
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- Programming an Arduino or similar device
- Using Arduino to control locks
- Exchanging data via Bluetooth

Hardware

- Bluetooth
- Devices for locks i.e. one of the following Arduino, Samsung Artik or Intel Edison.