University of Kaiserslautern

Department of Electrical Engineering and Information Technology

Microelectronic Systems Design Research Group

Bachelor Thesis

Design and Implementation of a Blockchain-Based Smart Outlet Concept

Entwurf und Implementierung eines Blockchain-basierten Smart Outlets Konzept

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Presented:	January 17, 2019
Author:	Daniel Gretzke (392488)
Head of Chair:	Prof. Dr.-Ing. Norbert Wehn
Tutor:	Dr.-Ing. Javier A. Varela

Statement

I declare that this thesis was written solely by myself and exclusively with help of the cited resources.

Kaiserslautern, December 19, 2018

Daniel Gretzke

Abstract

Abstract English here.

Zusammenfassung

Abstract Deutsch here.

Contents

1 Introduction

> Whereas most technologies tend to automate workers on the periphery doing menial tasks, blockchains automate away the center. Instead of putting the taxi driver out of a job, blockchain puts Uber out of a job and lets the taxi drivers work with the customer directly.
> — *Vitalik Buterin, co-founder of Ethereum*

The blockchain was first implemented in 2009 by Satoshi Nakamoto (pseudonym) and was called Bitcoin. Since then, it has steadily gained importance every year. Meanwhile thousands of cryptocurrencies and tokens were built on this technology. The hype in the year 2017 called the attention of many companies to blockchain and even last year, when prices dropped as far as 95%, the interest in this field didn't diminish.

Compared to traditional payment methods like Visa, Banks and PayPal, cryptocurrencies are built decentralized, meaning that there is no central organization that controls transactions, the issuance of new money, et cetera. The validity of the blockchain *P2P* (peer to peer) network is secured through cryptographic protocols. This entails some benefits. Usually traditional payment methods go with high transactions costs, most commonly in the amount of a few percent. On the contrary the cost of a single transaction on a blockchain averages out at just a few cents[**?**]. Some cryptocurrencies even work without any fees.

Because of this they are suited for micro transactions really well. There are some disadvantages through. The blockchain technology is still in an early stage and really immature. Compared to traditional electronic payments it only manages to achieve very few *TPS* (transactions per second) and has long transaction times. E.g. Bitcoin manages 2-7 TPS[**?**] as opposed to Visa, which manages to process almost 4000 TPS on average[**?**].

Another future trend is the electric car. It's expected that in a few years most cars on the road and almost all cars sold will be electric. Often these need to be charged overnight. Unfortunately, most city residents are familiar with the problem that you rarely park in front of their own house let alone own a garage. It's foreseeable that recharging your car might hampered. This bachelors thesis devotes itself to this problem. It examines whether a smart electric socket, which is placed outside the house by a homeowner, can be used to efficiently sell electricity and which payment method is suited best for this task. Afterwards a prototype is to be developed that implements the previously worked out concept.

2 Appendix

Pagebreak and linebreak has to be done manually with pygmentize, this feature is not yet implemented. Open the appendix.tex file and see the source code afterwards how the pagebreak is done. For that the appendix.tex has to be written with pagebreaks, so that the layout of the pages is done manually.
Linebreaks are easier to do, just check that the lines are in the box of the pdf file, otherwise make a linebreak yourself.

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