Research Internship Project Plan

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(Daily)Supervisor

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Context

Distributed ledged technologies like Blockchain are widespread nowadays. Among many advantages, one of the key concepts is relying on a (often computationally intensive) consensus protocol as mean to accomplish trust. When we look at the Bitcoin cryptocurrency system which uses a proof-of-work consensus algorithm, we see that the combined computational power has increased dramatically over the last few years [1]. At the same time, the energy usage of Bitcoin has been a point of debate with numerous estimates being made. A recent estimate in a paper by Vranken [2] estimates a total energy usage of 100 MW - 500 MW.

The second largest Blockchain technology is Ethereum, which is different from Bitcoin as it facilitates execution of so-called Smart Contracts. Smart Contracts are pieces of code whose correct execution is enforced by a proof-of-stake consensus algorithm. The Ethereum system differs fundamentally from Bitcoin and estimates of its power usage, let alone a model for its energy usage has not yet been clearly defined or are based upon questionable models [3]. The latter will be the focus of this research internship. By looking at available literature on the subject, a mathematical model will be constructed to determine or estimate the total power consumption of the Ethereum system.

Research activities

For now:

- Literature review
- Defining a mathematical model of the energy usage of Ethereum

Possibly later:

- Doing measurements using an experimental setup
- Validation of the mathematical model

Planning

For new, an estimate of the amount of time literature review will consume is appromixately 1,5 weeks: 60 hours. From there the next activity will take place which is defining a mathematical model from which it is not yet clear how much time this will consume. The total amount of hours in the scheme below amounts to 420 hours (15 ec).

Week 48			Week 49			Week 50			Week 51	
Day	**Hours**		**Day**	**Hours**		**Day**	**Hours**		**Day**	**Hours**
Mon	4 hours		Mon	8 hours		Mon	8 hours		Mon	8 hours
Tue	8 hours		Tue	8 hours		Tue	8 hours		Tue	8 hours
Wed	8 hours		Wed	8 hours		Wed	8 hours		Wed	8 hours
Thu	8 hours		Thu	8 hours		Thu	8 hours		Thu	8 hours
Fri	8 hours		Fri	8 hours		Fri	8 hours		Fri	8 hours

Week 52			Week 1			Week 2			Week 3	
Day	**Hours**		**Day**	**Hours**		**Day**	**Hours**		**Day**	**Hours**
Mon	Holidays		Mon	Holidays		Mon	8 hours		Mon	8 hours
Tue	Holidays		Tue	Holidays		Tue	8 hours		Tue	8 hours
Wed	Holidays		Wed	Holidays		Wed	8 hours		Wed	8 hours
Thu	Holidays		Thu	Holidays		Thu	8 hours		Thu	8 hours
Fri	Holidays		Fri	Holidays		Fri	8 hours		Fri	8 hours

Week 4			Week 5			Week 6			Week 7	
Day	**Hours**		**Day**	**Hours**		**Day**	**Hours**		**Day**	**Hours**
Mon	8 hours		Mon	8 hours		Mon	8 hours		Mon	8 hours
Tue	8 hours		Tue	8 hours		Tue	8 hours		Tue	8 hours
Wed	8 hours		Wed	8 hours		Wed	8 hours		Wed	8 hours
Thu	8 hours		Thu	8 hours		Thu	8 hours		Thu	8 hours
Fri	8 hours		Fri	8 hours		Fri	8 hours		Fri	8 hours

Week 8	
Day	**Hours**
Mon	8 hours
Tue	8 hours
Wed	8 hours
Thu	
Fri	

1. https://www.blockchain.com/charts/hash-rate?timespan=all ↵

2. Vranken, H. (2017). Sustainability of bitcoin and blockchains. Current opinion in environmental sustainability, 28, 1-9. ↵

3. Cole, R., & Cheng, L. (2018, July). Modeling the Energy Consumption of Blockchain Consensus Algorithms. In 2018 IEEE International Conference on Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber, Physical and Social Computing (CPSCom) and IEEE Smart Data (SmartData) (pp. 1691-1696). IEEE. ↵