Faculty of Technology, Natural Sciences and Maritime Sciences, Campus Porsgrunn

FMH606 Master's Thesis

Title: Integrating decentralized technologies with Internet of Things (IoT).

USN supervisor: Leila Ben Saad

External partner: N/A

Task background:

The emergence of decentralized technologies and development of Bitcoin changed the concept of digital currency and possibility of a distributed immutable ledger. The blockchain technology is now not only used in finance but also is popular in other industries and sector areas. IOTA is a similar decentralized technology designed to solve issues related to scalabiliy in Blockchain technology. Internet of Things (IoT) is one of the area where blockchain technology and IOTA can be used.

IoT devices have grown exponentially during the last few years which is raising concerns about its visibility over the internet and privacy. In recent years, Blockchain (BC) technology and IOTA have improved significantly and can be seen as a solution as it is a "secure by design" system. BC can also offer functionality such as smart contracts which can be seen as programmable logic, and which can be utilized for creating logic for access control, confidentiality, and authentication.

Task description:
In this thesis, a review of the use of decentralized technology in logging IoT data will be presented. IoT data can be operational data from machinaries which can be used by service providers for system maintenance or by government entities for compliance. The aim of this thesis is to develop a decentralized architecture for IoT domain, where data is read from an IoT device and stored securely in a decentralized ledger technology. Smart contracts are programmable applications stored in the blockchain, that can manage interaction under certain terms and conditions. The blockchains like Ethereum use flexible smart contract scripting languages. The smart scripting language Solidity will be used to write smart contracts for Ethereum. The use of IOTA– a dedicated IoT tangle, for similar functionality will be studied. A traditional database will be developed as a backup system. A discussion about the limitations and challenges encountered in the decentralized technolgogy integration for IoT domain will be made and possible improvement directions will be proposed.

Student category: IIA Student

The task is suitable for online students (not present at the campus): Yes

Practical arrangements:
N/A

Supervision:
As a general rule, the student is entitled to 15-20 hours of supervision. This includes necessary time for the supervisor to prepare for supervision meetings (reading material to be discussed, etc).

Signatures:

Supervisor (date and signature): 03/02/2022

Student (write clearly in all capitalized letters): Rejith Reghunathan (reserved)

Student (date and signature): *Rejith Reghunathan*
24.01.2022

References:

[1] M. Ali, M. Vecchio, M. Pincheira, K. Dolui, F. Antonelli and M. Rehmani, "Applications of Blockchains in the Internet of Things: A Comprehensive Survey", IEEE Communications Surveys & Tutorials, vol. 21, no. 2, pp. 1676-1717, 2019. Available: 10.1109/comst.2018.2886932.

[2]A. Panarello, N. Tapas, G. Merlino, F. Longo and A. Puliafito, "Blockchain and IoT Integration: A Systematic Survey", Sensors, vol. 18, no. 8, p. 2575, 2018. Available: 10.3390/s18082575.

[3]"What is IoT with blockchain? - IBM Blockchain | IBM", Ibm.com, 2022. [Online]. Available: https://www.ibm.com/se-en/topics/blockchain-iot. [Accessed: 11- Jan- 2022].