Introduction to the Blockchain Engineering Minitrack

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This is the fourth year of the "Blockchain Engineering" minitrack. This minitrack serves as an important forum because the global interest in blockchain has rapidly increased beyond cryptocurrencies and "enterprise blockchain" has been making great strides in becoming a mainstream. The pandemic amplified this trend. Numerous startups are currently developing blockchain enabled enterprise applications for addressing supply chain and safety issues unique to the new reality of social distancing and contact tracing.

Blockchain indeed represents a paradigm shift from centralized computing to decentralized. The intense interests in blockchain center around the decentralized system's ability to provide transparency, security, (pseudo-) anonymity and data integrity without any third-party organization in control of the transactions; it thus can enable trustless transactions and disintermediated societies. This minitrack aims at providing a forum for addressing the challenges arising from the paradigm shift and the "**how to**" of engineering an enterprise blockchain system that can fundamentally change how business value is created, discovered, and realized.

We are very proud that the paper nominated by this minitrack last year, entitled "**The DLPS: A New Framework for Benchmarking Blockchains**," by Johannes Sedlmeir, et. al, has won the Best Paper award of the HICSS-54 conference. This year, we are very excited to present another five interesting, timely and well-researched papers that answered our call to address current blockchain engineering challenges.

The first paper is entitled **"Performance Improvement by Using Pipelined Execution on Hyperledger Fabric."** by Ence Zhou, Bingfeng Pi, Jun Sun, Takeshi Miyamae, and Masanobu Morinaga. The paper focuses on an important Blockchain Engineering issue: evaluating and improving the performance of Hyperledger Fabric, which is the most popular blockchain platform for enterprises. Their pipelined execution technology processes multiple blocks in parallel and with additional pipeline acceleration schemes, was able to improve the performance significantly. Their experiments resulted in performance improvements of 4.38× for LevelDB and at least 2× for CouchDB.

The second paper is entitled "**A Serverless Distributed Ledger for Enterprises**," by Johannes Sedlmeir, Tim Wagner, Emil Djerekarov, Ryan Green, Johannes Klepsch, and Shruthi Rao. This paper clarifies some technical limitations of existing blockchain technologies and challenges with their integration into enterprises' IT systems. It proposes a novel distributed ledger design that is ``serverless'', i.e., built on cloud-native resources. The authors evaluate the qualitative and quantitative properties of the design and give evidence that enterprises already heavily reliant on cloud service providers would consider such an approach acceptable, providing that it offers ease of deployment, low transactional cost structure, and a combination of latency and scalability aligned with real-time IT application needs.

The third paper is entitled "**Developing a Zen Click Fraud Detection Framework Using Smart Contracts**," by Sean Sanders and Luke Ziarek. This paper integrates the Soot compiler framework, blockchain smart contracts, online malware identification, and static and dynamic analysis techniques to develop an auditing framework for detecting malvertising click fraud found in the Zen malware family, part of the PHA (potentially harmful application) family. This research aims to detect malvertising click fraud in Android applications, but the approach and the resulting framework can also be used to counter mobile malware families.

The fourth paper is entitled "**Incentivized Research Data Sharing, Reusing and Repurposing with Blockchain Technologies,**" by Oshani Seneviratne and Deborah McGuinness. This paper presents an innovative approach, utilizing blockchain smart contract, for sharing research data in settings where data is either sensitive or valuable (or both) to have formal data use agreements or sometimes less formal rules for reuse. This work is a departure from the traditional natural language-based data use

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agreements and aims at making these agreements more computable, resulting in enhanced usability for a broader community. The authors engineered an innovative incentive mechanism for sharing data using an ERC20 token, a popular technical standard for developing fungible tokens on the Ethereum blockchain. The system can be used to track data reuse, thus providing metrics for use in measuring data producers' impact for enterprise reward structures and research measures such as an h-index. How this approach could radically improve the quality and the efficiency of scientific output in the setting of research data sharing is discussed.

The fifth paper is entitled "**Blocked-based Solidity — a Service for Graphically Creating the Smart Contracts in Solidity Programming Language,**" by Anna Kobusińska and Grzegorz Wilczynski. This paper proposes a service that enables the creation of smart contracts by constructing diagrams from graphical blocks. The diagrams will then be transformed into a smart contract code written in the Solidity language. The paper further presents selected use cases for illustrating its application.