Date of current version May 12, 2021.
Digital Object Identifier 10.1109/ACCESS.2021.3075115

EDITORIAL

IEEE ACCESS SPECIAL SECTION EDITORIAL: BLOCKCHAIN-ENABLED TRUSTWORTHY SYSTEMS

We are enjoying the benefits brought by the accelerated development of computing systems and the Internet. However, we are also facing a few security and privacy vulnerabilities caused by the increasing system complexity, heterogeneity, dynamicity, and decentralized nature. These security and privacy vulnerabilities may prevent the wide adoption of information and communications technology (ICT). Therefore, trust management has become a crucial aspect of developing trustworthy systems with the preservation of security and privacy. The recent advances in blockchain technologies are bringing opportunities in fully realizing trustworthy systems. Blockchain technologies can enable anonymous and trustful transactions in decentralized and trustless environments. As a result, blockchain-enabled trust management must help to reduce system risks, mitigate financial fraud, and cut down the operational cost of computing systems. Blockchain-enabled trustworthy systems can apply to diverse areas, such as financial services, social management, the Internet of Things, and supply chain management.

The objective of this Special Section was to solicit high-quality and unpublished work regarding recent advances in blockchain-enabled trustworthy systems. In total, 68 manuscripts were submitted to this Special Section. After a rigorous peer-review process, we finally selected 16 high-quality articles for publication. Here, we briefly present each of the published articles.

The article entitled ''A blockchain-based traceable IP copyright protection algorithm,'' by Xiao *et al.*, presents a blockchain-based intellectual property (IP) copyright protection scheme that protects IP trading. ''Fabric-IoT: A blockchain-based access control system in IoT,'' by Liu *et al.*, proposes an access control (AC) system for the Internet of Things (IoT). This system is designed and developed on top of the hyperledger fabric blockchain framework with the integration of attributed-based access control. Simulation experiments demonstrate the efficiency of the proposed scheme. In the article ''Blockchain-based safety management system for the grain supply chain,'' by Zhang *et al.*, the authors investigate the food-safety issues based on blockchain. In particular, a blockchain-based framework is proposed for the grain supply chain to guarantee data security, reliability, and traceability. In the article ''Leveraging $N-1$ queues to improve the energy efficiency of scalable computing,'' by Hu *et al.*, the authors present an $N-1$ queueing and on-demand resource provisioning method to process workloads in the mode of $N-1$ service queues to achieve elastic and scalable blockchain.

In the article ''State channel as a service based on a distributed and decentralized web,'' by Podgorelec *et al.*, the authors propose a method to ensure transparency and traceability of the state channels of blockchain. The article ''An improved proof-of-trust consensus algorithm for credible crowdsourcing blockchain services,'' by Zhu *et al.*, presents a blockchain-based scheme to ensure the credible accountability of crowdsourcing services. Empirical studies demonstrate the effectiveness, feasibility, and scalability of the proposed approach. The article entitled ''A blockchain-assisted trust access authentication system for solid,'' by Cai *et al.*, presents a blockchain-based system to guarantee secure authentication and fine-grained access control for social linked data (solid). In the article ''A collaborative auditing blockchain for trustworthy data integrity in cloud storage system,'' by Huang *et al.*, the authors devise a collaborative auditing blockchain framework for cloud data storage. Both security analysis and experimental results demonstrate the data integrity and effectiveness of the proposed framework.

In the article entitled ''Stochastic neural networks for cryptocurrency price prediction,'' by Jay *et al.*, the authors propose a stochastic neural network frame for cryptocurrency price prediction by introducing layer-wise randomness. Extensive experimental results show that the proposed model outperforms other deterministic models. The article ''BDSS-FA: A blockchain-based data security sharing platform with fine-grained access control,'' by Xu *et al.*, presents a blockchain-based data-sharing system, which can offer fine-grained access control and ensure security. In the article entitled ''Secure digital certificate-based data access control scheme in blockchain,'' by Liu *et al.*, the authors design and develop a digital certificate-based data access scheme to achieve secure control of blockchains. Experimental results

show the outstanding performance of the proposed scheme. The article "An overview on blockchain for smartphones: State-of-the-art, consensus, implementation, challenges, and future trends," by Ometov *et al.*, presents a survey on blockchain for smartphones. The focus of this article is to investigate the possibility of using blockchain for battery-constrained smartphones.

In the article "Investigating smart home security: Is blockchain the answer?" by Arif *et al.*, the authors investigate the usage of blockchain for smart homes, especially from the security perspective. In particular, the authors present a blockchain-based framework to ensure the security of a smart home. A case study from an experimental testbed demonstrates the feasibility of the proposed framework. In the article entitled "An architecture for easy onboarding and key life-cycle management in blockchain applications," by Genés Durán *et al.*, the authors propose a framework to facilitate the user onboarding process and simplify key life-cycle management for blockchain applications. The article entitled "GDPR compliance verification in Internet of Things," by Barati *et al.*, investigates the usage of blockchain to address data privacy for IoT with respect to the European General Data Protection Regulation (GDPR). In the article "ChainFaaS: An open blockchain-based serverless platform," by Ghaemi *et al.*, the authors propose a blockchain-based system, ChainFaaS, to harness personal computers' idle computational capacity to conduct serverless tasks, thereby reducing the burdens at central servers. A prototype of ChainFaaS demonstrates the feasibility of the proposed framework.

The Guest Editors would like to thank all the authors who submitted their works to this Special Section on blockchain-enabled trustworthy systems. They would also like to thank their appreciation for the referees who voluntarily participated in the reviewing process on a very tight schedule. Finally, the Guest Editors want to give their sincere thanks to IEEE ACCESS Editor-in-Chief, Prof. Derek Abbott, as well as the whole IEEE ACCESS editorial staff for their invaluable support.

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