

12th Turkish National Software Engineering Symposium

Invited Talk:

Blockchains for CyberPhysical Systems: Applications, Opportunities and Challenges

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Abstract. In a cyber-physical system (CPS), computing elements coordinate and communicate with sensors, which monitor cyber and physical indicators, and actuators, which modify the cyber and physical environment where they are run. Current CPS ecosystems rely on centralised, brokered communication models, otherwise known as the client-server paradigm. All devices are identified, authenticated and connected through cloud servers and the data collected by the devices is stored in the cloud for further processing. While this model has connected generic computing devices for decades and will continue to support small-scale CPS networks as we see them today, it will not be able to respond to the growing needs of the large-scale CPS ecosystems of tomorrow with billions of connected devices. Cloud servers will remain a bottleneck and point of failure that can disrupt the entire network. This is especially important as critical services and infrastructure such as healthcare, electric grids, logistics, transportation become dependent on CPS. The current stove-piped architecture has also created isolated data silos, where users have limited control over their data and how it is used. Users have to trust the cloud and application providers and have no choice but to rely on their promises of security and availability.

In this talk we will explore how Blockchain (BC) technology has the potential to overcome the aforementioned challenges. BC is an immutable timestamp ledger of blocks that is used for storing and sharing data in a distributed manner. The stored data might be payment history, e.g. Bitcoin, or a smart contract or even personal data. In recent years, BC has attracted tremendous attention from practitioners and academics in different disciplines (including law, finance, and computer science) due to its salient features which include decentralization, immutability, auditability and security and privacy. The talk will specifically consider three key aspects of CPS which include: (i) Internet of Things; (ii) Intelligent Transportation; and (iii) Supply Chain. The talk will explain relevant concepts, review the state-of-the-art, present representative solutions and discuss open challenges.

Biography. Salil Kanhere received his M.S. and Ph.D. degrees, both in Electrical Engineering from Drexel University, Philadelphia. He is an Associate Professor in the School of Computer Science and Engineering at UNSW Sydney, Australia. He is also a conjoint researcher at Data61 CSIRO, Faculty Associate at Institute of Infocomm Research Singapore and on the advisory board of two technology start-ups. His research interests include Internet of Things, pervasive computing, blockchain, crowdsourcing, data analytics, privacy and security. He has published over 180 peer-reviewed articles and delivered over 20 tutorials and keynote talks on these research topics. He has received 4 Best Paper Awards. His research has been featured on ABC News Australia, Forbes, Wired, ZDNET, MIT Technology Review, Computer World, IEEE Spectrum and other media outlets. Salil serves on the Steering Committee of IEEE LCN and is the program co-chair for IEEE WoWMoM 2018 and ACM MSWiM 2018. He regularly features on the organizing committee of a number of IEEE and ACM international conferences. He is on the Editorial Board of Elsevier's Pervasive and Mobile Computing and Computer Communications, serves as the Chair of the IEEE Computer Society's Technical Meeting Review Committee (TMRC) and on the Executive Committee of the IEEE Computer Society's Technical Committee on Computer Communications (TCCC). Salil is a Senior Member of both the IEEE and the ACM. He is a recipient of the Alexander von Humboldt Research Fellowship.