SPECIAL ISSUE ON BLOCKCHAIN-ENABLED INDUSTRIAL INTERNET OF THINGS: ADVANCES, APPLICATIONS, AND CHALLENGES

IMPORTANCE OF TOPIC

The revolutionary digitization of industry coupled with the proliferation of the Internet of Things (IoT) has caused a paradigm shift for industrial and manufacturing companies, renowned as Smart Industry or the Industrial Internet-of-Things (IIoT). This concept, also advertised as Industry 4.0, leverages the power of smart machines fused with realtime analytics, cyber-physical systems, and cloud and cognitive computing to capture and exploit massively produced and communicated data. IIoT aims at promoting multi-disciplinary business intelligence and support, efficient quality control and traceable supply chains, predictive maintenance, enhanced field service, and asset tracking, as well as sustainable green practices. An IIoT ecosystem mainly focuses on effectively controlling the physical world comprising smart devices distributed across the entire industry to collect and securely exchange and analyze massive ambient data.

While cloud computing constitutes a fertile soil for handling such issues, it, however, necessitates highend servers and high-speed networks to provision storage-/computation-related services. In this regard, a centralized cloud-enabled IIoT framework is perceived by IoT services as a black box with impeding factors of resilience, adaptability, fault tolerance, trust, security and privacy, maintenance costs, and time-critical IoT applications' support. Stepping towards coping with these challenges, blockchain represents one of the most suitable candidate technologies able to support a secure and distributed IIoT ecosystem. The blockchain is an amalgamation of cryptography, public key infrastructure, and economic modeling, applied to peer-to-peer networking and decentralized consensus to achieve distributed database synchronization. Its properties of decentralization, immutability, auditability, and fault-tolerance render it attractive for augmenting a decentralized IIoT environment. Various industry solutions and platforms from Lola, COSMOS, Dajie, Filament, Slock.it, SmartAxiom, BlockVerify, Xage Security, Ubirch, Multichain, ShoCard, Chronicled, Uniquid, Chronicled, Riddle and Code, Datum have already been floated in the market for public, private, and federated blockchains to address privacy, monetization, security, trust, identity and data management issues.

From the perspective of blockchain employment across the wide range of IIoT use-cases (e.g., in food industry, cybersecurity, voting, music, real estate, healthcare, insurance, supply chain and logistics, energy and smart grid, apparel, textile and fashion industry, among others), there exist numerous operational and technical challenges that stand in the way of achieving absolute IIoT decentralization using blockchain, given the vast diversity of the IIoT application space. Such technical challenges include but are not limited to risks and regulatory issues as well as other associated factors related to processing, storage, communications, and availability. Additionally issues of security, privacy, trust and scalability must be considered.

SCOPE OF SPECIAL ISSUE AND CALL FOR ARTICLES (CFA)

The IEEE Internet of Things Magazine is soliciting high-quality manuscripts that: a) describe in-depth and breadth real-world blockchain-based multi-disciplinary IIoT deployments that go in-line with the above-elaborated special issue, b) present actual experiences in resolving contextual blockchain-related challenges and c) develop and share best practices, vision realizations and lessons learned in this integrated environment, and d) establish guiding principles for technical, operational and business successes. Articles should be general, independent of technical or business specialty, and intended to an audience consisting of all members of the IoT community. Topics may include, but are not limited to:

- Providing insights into the exploitation of Blockchain as a provably lightweight, secure and consensus distributed security solution for current IIoT applications with the objective of resolving centralization problems;

- Giving practitioners a preview of what to expect in terms of challenges associated with using blockchainbased services (*e.g.* sharing, network monitoring, security, content distribution, provenance, etc) in IIoT environments and providing them with information on how to efficiently resolve them;
- Discussions, exchanges of ideas and insights for both industry practitioners and academic researchers into the design and development of complexity-minimal Consensus and Blockchain-based distributed protocols in IIoT;
- Lessons-learned from best practices in blockchain-augmented IIoT deployments in different environments such as:
    - Augmenting blockchain-enabled IIoT with artificial intelligence for the purpose of intelligent decision making;
    - Assessing, comparing and understanding the performance of blockchain-enabled IIoT deployments with the objective of early identifying possible vulnerabilities/breaches to avoid unwanted/unexpected chaotic incidents;
    - Trading-off and understanding the difference between Public, Private and Consortium/Federated/Permissioned blockchain.
- Tutorials on:
    - Human-computer interaction in IIoT blockchain-aware application development;
    - Data structuring, storage and management and security techniques for blockchain-enabled IIoT;
    - Decentralized database deployments for blockchain-enabled IIoT;
    - Identity management for interconnecting things in IIoT;
    - Distributed software-defined networking control in blockchain-enabled IIoT;
    - Integration of blockchain in fog, edge and cellular networks for efficient, effective and reliable IIoT communications.
- Leveraging the blockchain-enabled IIoT for social networking, decentralized autonomous organizations, energy, smart grid, logistics, transportation, supply chain, monetization, e-business, notarization, egovernment, healthcare, commerce, insurance, finance, banking, education, learning, crowdsourcing and crowd sensing applications.

IMPORTANT DATES

Participants are asked to prepare their articles according to the Guide for Authors and submit them via the Manuscript Central.

Manuscript Submission Due: October 30, 2019
Revision Notification Due: December 30, 2019
Acceptance Notification Due: February 30, 2019
Final Manuscript Due: April 15, 2020
Guest Editorial/Columns Due: April 1, 2020
Expected Publication of the Special Issue: June 2020

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