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Special Issue on
# Challenges and Solutions for Next-Generation Extensible IoT Systems

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Advancement in wired and wireless sensing and communication technologies has enabled researchers and practitioners to investigate increasingly diverse, complex, and extensible IoT applications such as smart cities, smart grid monitoring, infrastructure and asset management, and environmental monitoring. These systems are envisioned to include millions of possible mobile nodes communicating over wireless communication channel in real-time. Furthermore, given the scale of the applications, service providers are increasingly adopting cloud-based solutions to provide reliable and scalable service. In addition, to reduce the burden on the back-end infrastructure, researchers are investigating ways to perform a significant part of the computation and storage on edge devices (a.k.a. fog computing).

One of the key characteristics of these next-generation extensible IoT systems is their distinct evolving nature where the number and types of nodes joining and leaving the network can change in real-time, causing unpredictable load conditions, both at the communication layer and the data storage and processing layer. As such, it is imperative to investigate novel scalable algorithms and performance modeling framework for efficient resource allocation to ensure graceful degradation of performance in such (possibly safety-critical) systems. There are a number of pertinent research challenges that have not been answered well, for example, how to design and analyze reliable communication protocols, design group management service, allocate resources across multiple layers (including the communication and the data processing back-end layers), predict the cascading effect of system changes on performance across system layers, achieve security and privacy, identify faulty nodes and erroneous data in real-time, and design fault-tolerant scalable data analytic algorithms.

The focus of this special issue is to investigate and address the limitation of the existing communication protocols, system architecture, storage systems, data analytic algorithms, programming paradigms, and resource allocation strategies, for IoT.

Potential topics include but are not limited to the following:

- ▶ Design of scalable communication protocols for extensible IoT systems
- ▶ IoT in design of real-time QoS aware communication paradigms
- ▶ Novel scalable IoT programming paradigms
- ▶ Design of group management services and algorithms for IoT systems
- ▶ System architecture and algorithms for IoT systems
- ▶ Extensible mathematical models for analyzing system capacity for IoT systems
- ▶ Scalable algorithms for management and tuning of system configurations in IoT systems
- ▶ Scalable algorithms for resource allocation and management
- ▶ System architecture for fault-tolerant data storage and processing in IoT systems
- ▶ Scalable algorithms for distributed failure detection and recovery
- ▶ Emerging security and privacy challenges in IoT systems
- ▶ Novel IoT applications and services

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