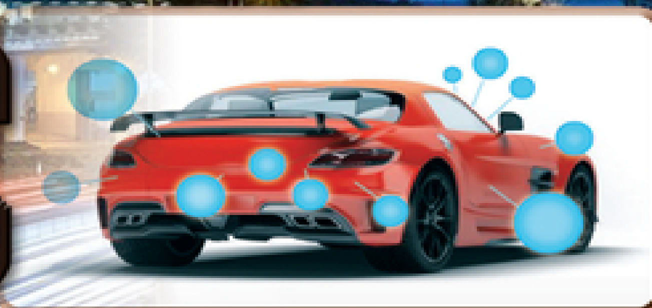
CLOUD AND IOT-BASED VEHICULAR AD HOC NETWORKS



Edited by

Gurinder Singh
Vishal Jain
Jyotir Moy Chatterjee
Loveleen Gaur

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Scrivener Publishing
100 Cummings Center, Suite 541J
Beverly, MA 01915-6106

Publishers at Scrivener
Martin Scrivener (martin@scrivenerpublishing.com)
Phillip Carmical (pcarmical@scrivenerpublishing.com)

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Preface

As technology continues to weave itself more tightly into everyday life, socioeconomic development has become intricately tied to ever-evolving innovations. An example of this is the technology being developed to address the massive increase in the number of vehicles on the road, which has resulted in more traffic congestion and road accidents. This challenge is being addressed by developing new technologies to optimize traffic management operations. That is why it is with great pleasure that we put forth this book on the topic of Cloud- and IoT-based vehicular ad hoc networks.

Current progress in wireless communication, computing paradigms and the internet of things (IoT) have resulted in the enhancement of intelligent devices equipped with wireless communication capabilities and highefficiency processors. As a result of the development of wireless technologies there has been a rapid growth in the use of the IoT, cloud computing and the number of smart vehicles, and along with it the demand for smart devices, such as smartphones, PDAs, smart watches, smart TVs, laptops, etc., connected to the cloud. However, conventional vehicular ad hoc networks (VANETs) face several technical challenges in deployment due to less flexibility, poor connectivity, and inadequate intelligence. Cloud computing, vehicular cloud computing, IoT and VANET are the major components in the current intelligent transport system (ITS). Various research studies on VANETs, cloud concepts and the IoT show that they have significant effects on smart transportation systems.

In order to address global concerns, a collection of the innovative research in these areas is presented in “Cloud-and IoT-Based Vehicular Ad Hoc Networks". This book covers the emerging and advanced concepts of VANETs and their integration with cloud computing and IoT, emerging wireless networking and computing models. Highlighting a wide range of topics, such as the IoT, Fog computing, and 5G, it is ideally designed for engineers, technology developers, IT specialists, policymakers, academicians, researchers, and students. The topics presented in each chapter are unique to this book and are based on the unpublished work of the contributing authors. In editing this book, we attempted to bring into the discussion all the new trends, experiments, and products that have made the vehicular ad hoc network such a dynamic area. We believe the book is a suitable reference for a larger audience, including system architects, practitioners, developers, and researchers.

Chapter 1 focuses on the need for 5G for IoT devices. The authors emphasize that faster communication can yield the full capabilities of IoT devices in various application domains such as healthcare, the industrial internet of things (IIoT), agriculture, etc. Chapter 2 deals with the fundamentals and technological details of VANET, 5G, and the need to integrate the VANET with 5G. The need for service discovery is also discussed along with the service discovery mechanism. Petty performance evaluation metrics and service discovery in the 5G-VANET milieu are also discussed. Chapter 3 primarily reviews the ARM 9 vehicle safety processor. It further focuses on its future applications, challenges, and significance in the smart transportation system. Chapter 4 focuses on the automatic emergency system in each vehicle, the use of which automatically transmits an emergency message from the location of an accident to the closest emergency center.

In Chapter 5, an interleaver-centric conflict management (ICM) solution for both vehicular and cognitive IoT (CIoT) communications is explored, which offers a coordination mechanism among the devices and/or networks to manage the conflict. Chapter 6 proposes an integrated system model to ensure safe and secure transportation, providing a very comfortable zone for humankind in terms of reliability, thereby reducing fatalities due to road accidents. Chapter 7 focuses on a wireless sensor network (WSN) in IoT and Cloud platforms. It covers the introduction of IoT Cloud and WSN architecture, and discusses the challenges and opportunities of IoT Cloud. In Chapter 8, a comparative study is done on various mechanisms for providing security and privacy to vehicles and data. The comparative analysis is very helpful to users when selecting the best model for security and privacy. In Chapter 9, the authors discuss the fundamental concepts of software defined networking (SDN), where three planes of SDN are defined and discussed in the form of SDN architecture. This chapter provides an insight into how SDN works along with a comparative review of a traditional network and SDN. The authors explain the underlying SDN security architecture and related several security threats.

The aim of Chapter 10 is to produce and design an efficient routing protocol for VANETs which can employ ad hoc on-demand distance vector routing algorithms for running the operation of both ad hoc mobile networks. Chapter 11 presents a mechanism for multilayer cluster-wise key generation for secure communication among service-oriented highly dense VANETs. The key generated from this mechanism is used as the secure key for different communications or authentications. The authors divide the whole VANET into several clusters. Chapter 12 investigates and evaluates some of the recently projected SDN-VANET methodologies and trust management systems. It also presents advanced cloud computing strategies that satisfy the requirements in VANETs and emerging technologies for future VANETs. Chapter 13 discusses the best machine learning algorithm to transmit the nodes effectively from source to destination node in order to reduce computational complexity and increase detection accuracy. It also focuses on machine learning application in ad hoc networks and various protocols of mobile ad hoc networks (MANETs).

Chapter 14 relates to the realization of a smart vehicle at the Electronics and Communication Engineering (ECE) Department at Sikkim Manipal Institute of Technology (SMIT), a constituent college of Sikkim Manipal University (SMU), at its 5G IoT Center of Excellence, by emulating three 5G use cases. It presents the details of the development stages with 5G technology for proof of concept (POC) supported by field trials. One industrial review is also included to note the SMIT development standpoint with NXP semiconductors and a comparison is tabulated for better understanding. In Chapter 15, a hybrid mechanism wherein the priority aware mechanism and the power aware mechanism are incorporated into the existing MANET protocols; and the impact of this hybrid mechanism on the quality of service parameters is investigated. Chapter 16 proposes a smart routing model that combines an existing Smart Traffic for Congestion Avoidance framework and a new framework called Massive Online Analysis-Fogged Routing, which overcome some issues related to smart traffic congestion avoidance-related big data transmission to the cloud that is solved by fog and big data mining. Chapter 17 focuses on new research areas and applications of unmanned aerial vehicles (UAVs), mainly due to their autonomy, flexibility, speed and quantum of data provided by UAVs or swarm UAVs.

In conclusion, we are grateful to all those who directly and indirectly contributed to this book. We are also grateful to the publisher for giving us the opportunity to publish it.

Gurinder Singh, India
Vishal Jain, India
Jyotir Moy Chatterjee, Nepal
Loveleen Gaur, India
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Jyotir Moy Chatterjee

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IoT in 5th Generation Wireless Communication

Sandeep Mathur* **and Ankita Arora**
Amity Institute of Information Technology, Amity University, Noida, Uttar Pradesh, India

Abstract

During the last decade, the Internet of Things (IoT) has reformed the universal registering with a large variety of utilization worked around totally different styles of sensors. With an oversized portion of the problems at convenience and convention levels apprehended throughout the previous decade, there is a developing pattern in the change of integrity of detectors and sensor-based frameworks with digital framework. IoT advances, for instance, machine to machine correspondence supplemented with perceptive information examination is relied upon the qualitative fast moving computer networks. The event of distributed computing and its augmentation to mist worldview with a multiplication of savvy ‘shrewd’ gadgets is relied upon to steer additional advancement in IoT. These enhancements energize the United States and structure a plan to summary actual work, arrange new ways, and acknowledge new uses of IoT. Specialists, researchers, and designers face developing difficulties in structuring IoT-based frameworks which will proficiently be coordinated with the 5G (5th Generation) remote correspondences. 5G considered as a principal empowering agent in satisfying consistently expanding needs for the future “IoT” administrations, including high information rate, various gadgets association, and low assistance dormancy. To fulfil these requests, organize cutting and mist registering have been considered as the promising arrangements in the 5G administration. Nonetheless, security standards empowering validation and secrecy of 5G correspondences for the IoT administrations remains as the key element. Right now,