Chapter 4
Trust Management in Vehicular Ad-Hoc Networks and Internet-of-Vehicles:
Current Trends and Future Research Directions

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ABSTRACT

Vehicular ad-hoc network (VANET) and internet-of-vehicles (IoV) are complex networks which provide a unique platform for vehicles to communicate and exchange critical information (such as collision avoidance warnings) with each other in an intelligent manner. Thus, the information disseminated in the network should be authentic and originated from legitimate vehicles. Creating a trusted environment in the network can enable the vehicles to identify and revoke malicious ones. Trust is an important concept in VANET and IoV to achieve security in the network, where every vehicle equipped with an appropriate trust model can evaluate the trustworthiness of the received information and its sender. This chapter discusses trust in both VANET and IoV and identifies various trust models developed for VANET and IoV. The contribution of this chapter is threefold. First, the authors present a detailed taxonomy of trust models in VANET and IoV. Second, they provide current trends in the domain of trust management specifically for VANET and IoV, and finally, they provide various open research directions.

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INTRODUCTION

Recent past has observed a dramatic increase in urban population, thus, continuously escalating cities across the globe. This results in numerous issues relating to transportation including traffic accidents and congestions. According to World Health Organization (WHO), these traffic accidents are responsible for the loss of 1.25 million lives per year, making it the ninth leading cause of human casualties around the world (WHO, 2015). Therefore, an urgent attention is required by the respective authorities to solve these transportation issues. VANET is an innovative transportation technology which partially solves these issues by connecting vehicles with each other directly or via adjacent infrastructure such as Roadside Units (RSUs) in order to improve traffic efficiency. In VANET, vehicles equipped with different sensing and communication capabilities share messages with each other through vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication to offer various applications including traffic management, black-ice and steep-curve warnings, congestion and traffic accident avoidance.

Lately, Internet-of-things (IoT) has emerged as a novel computing paradigm which provides connectivity to plethora of devices with sensing and communication capabilities to the Internet. These devices are connected to the Internet via various communication technologies including Wi-Fi, ZigBee, Bluetooth, LTE and 5G, thus, providing a wide range of applications such as smart homes, smart grid, smart health, smart factories etc (I. Yaqoob, I. A. T. Hashem, Y. Mehmood, A. Gani, S. Mokhtar, S. Guizani, 2017) (Y. Mehmood, F. Ahmad, I. Yaqoob, A. Adnane, M. Imran, S. Guizani, 2017). In the domain of transportation, IoT has evolved into a novel paradigm known as "Internet-of-Vehicles (IoV)" (F. Yang, S. Wang, J. Li, Z. Liu, Q. Sun, 2014). IoV provides a more general concept where vehicles act as intelligent and smart devices to interact with the neighbouring environment and to make informed decisions based on the exchanged information. In other words, IoV is the result of VANET and IoT hybridization. VANET and IoV also play a vital role in the emerging smart cities, where, the aim of these technologies is to improve the overall traffic by reducing traffic accidents and better traffic management.

Figure 1 highlights the important components involved in VANET and IoV, such as RSU (static entity), vehicles (mobile entity), different communication modes and application center. RSU (such as traffic lights, mobile communication base stations, speed cameras etc.) is a static unit in