

Chapter 1

VANETs and the Use of IoT: Approaches, Applications, and Challenges

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ABSTRACT

The vehicular ad-hoc network (VANET) has emerged as the most sought-after technology due to its wide range of applications. In this modern era, people are looking for intelligent systems that include intelligent transport systems, which is not possible without the use of modern techniques such as the internet of things (IoT), VANETs, and cloud computing. With the growing demand for luxury cars, and people's need for safety, the ad-hoc car network is experiencing growth. The connectivity between the vehicle is possible using sensor communication among vehicles in the network. For transmitting forthcoming traffic information in case of a vehicle accident, car connectivity plays a vital role to connect to other vehicles so that appropriate actions can be taken. In this chapter, applications, protocols, trust models, and challenges of VANETS are discussed. The purpose of this chapter is to discuss and elaborate on various aspects related to VANETs and IoT. In addition, the chapter discusses characteristics, challenges, and security concerns in VANETS-based applications.

DOI: 10.4018/978-1-6684-4991-2.ch001

INTRODUCTION TO VANETs AND IOT

Internet of Things (IoT), which is fast emerging as a powerful technology, coupled with intelligent and integrated sensor network systems and domestic sensor networks are anticipated to have an impact on people's daily lives and stimulate a significant market shortly. The Internet of Things is a network of connected things such as mobile devices, smart sensors in the vehicle, digital machines, other computing devices, and even people. IoT has expanded into the field of smart vehicles and turned into something called as Internet of Vehicles (IoV) (Ahmood, 2020). The proper functioning of IoV is based on Vehicular Ad-Hoc Network. An integral component of any "Intelligent Transport Systems" (ITS) is VANET, who's growth is accelerating fast. VANET and IoT are currently the most crucial components of the "Intelligent Transport System" (ITS). The research study in the past decade on VANET and IoT indicates that both have a significant impact on intelligent transportation systems. Road accidents, congestion, fuel consumption, and environmental pollution have all become major global challenges as the number of automobiles increases. In both developed and developing countries, traffic accidents frequently cause massive loss of property and human life. ITS formed and implemented VANETs to provide infrastructure for transportation of all types. The importance lies in dealing with prevalent issues in transportation to make the journey for everyone safer, effective, hassle-free, and enjoyable (Hossain et al., 2012).

In any Mobile ad-hoc network, an integral part is VANET and therefore, nodes operate inside the networking region and devices operating in that area. Transfer of information with one another through single-hop or multi-hop through a road-side unit (RSU) (Patel et al., 2015). VANET's advantage is to improve vehicle safety by switching caution messages among vehicles. VANET's main concern is to improve passenger safety and the exchange of security messages between locations. Security is very important for VANETs because of the scarcity of centralization, and powerful arrangement of nodes leading to extreme difficulty in recognizing nodes or network vehicles that are dangerous and, malicious (Hussain et al., 2015). Vehicles are in direct contact with some other vehicle, if in case, there exists the availability of wireless connection; it is called a single vehicle to vehicle (V2V). All the motor vehicles operating within the network are connected to Road-Side-Unit (RSU) which further expands the network vehicle communication by sending a message and getting details from them.

In VANETs, the two primary types of applications are *safety and non-safety applications*. For purpose of sending safety messages, safety applications are used such as warning messages. Warning messages help and assist vehicles on the road in case of collisions that saves a life. Messages regarding road safety include reports of car accidents, traffic jams, road construction, and alerts from emergency vehicles

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