Chapter 1
Handover Mechanisms in Internet of Vehicles (IoV):
Survey, Trends, Challenges, and Issues

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ABSTRACT

Vertical handover is one of the key technologies that will enable the connected and autonomous vehicles deployment. The emergence of vehicular networks—V2V, V2I, V2X—communications has enabled new applications, such as cooperative intelligent transport systems (C-ITS), real-time applications. However, these networks are characterized by a high level of mobility and dynamic change in the topology, which generates scattered networks. To address this problem and ensure a high level of performance, a new concept denoted heterogeneous vehicular networks (HVN) emerged, which is a key concept of the internet of vehicles (IoV). It consists in a hybridization the vehicular network (IEEE 802.11p) and cellular networks (3G/LTE/4G). In this chapter, authors introduced this new concept of IOV and its architectures and communication layers. Then they explored the different existing data relaying mechanisms in order to propose a new classification of handover approaches. After that, they presented the support of handover mechanisms in LTE and finally highlighted some handover challenges and issues.

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INTRODUCTION

Vehicular networks are emerging networks that connect vehicles with each other and with the road infrastructure. They allow to implement safety applications (collision avoidance, works prevention, etc.), real-time applications (autonomous driving), intelligent transportation systems applications (traffic management, detour proposal, etc.) and comfort applications (automatic toll payment, connecting to the online media, etc.). Vehicle needs a near-continuous connection to work properly. Since connected vehicles will take time to spread and equipping the road with RSUs is long and expensive task, it is intuitive to use other available networks in the vehicle such as passengers 'mobile phones networks in addition to the IEEE 802.11p vehicular network. The cellular networks (3G, LTE, 4G) are promising alternative candidates thanks to their wide deployment and accessibility (in general, smartphones are available in most vehicles) as illustrated in figure 1.

The high level of mobility and the dynamic change in the topology, which most characterize vehicular networks (i.e VANETS), makes connected vehicles' deployment and applications very challenging. However, the large and very fast development of telecommunications systems, and more recently, the deployment of IoT (Internet of Things) allow a significant contribution in this field and currently, many communication systems are developed. This encourages the development of a novel concept called IoV (Internet of Vehicles) (Gerla et al., 2014) which defines the communication possibilities between his 6 main components which are: Vehicle (V), Person (P), personal devices (D), network Infrastructure (I), Sensing device (S) and Roadside

Figure 1. Heterogeneous vehicular networks HVN and Internet of vehicles IOV concept (Kaiwartya et al., 2016)