

Chapter 5

On-Demand Routing Protocols for Vehicular Cloud Computing

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ABSTRACT

In vehicular cloud computing systems (VCC), the overlapping transmission range of each vehicle ensures a unified and common channel for communication among the vehicles. The flexibility of VCC systems opens the door to myriad applications that contribute to the safety and comfort of the passengers. They are distributed, self-organizing communication networks built up by moving vehicles, and are thus characterized by very high node mobility and limited degrees of freedom in mobility patterns. Such particular features often make the standard networking protocol inefficient or unusable, hence the growing effort in the development of communication protocols, which are specific to vehicular networks. Routing protocols should be selected carefully after carrying out literature review. This chapter has investigated different on-demand routing protocols and focused to identify the efficient on-demand routing protocol that can give better performance in realistic environments of vehicular cloud computing systems.

1. INTRODUCTION

In recent times, the number of vehicles is increasing at rapid speed. Vehicles can communicate with each other and to the road side unit with the help of some wireless technology. Inter-communication of vehicles and to the road side unit is considered as Vehicular Ad-hoc Networks (VANETs).

In order to establish communication between vehicles and roadside units (RSU's), every vehicle must contain some kind of radio interface or onboard unit (OBU) that would be responsible for short range communication in Vehicular Ad-hoc Networks. For smooth communication, all vehicles should be equipped with GPS system. Various protocols are responsible for this network.

DOI: 10.4018/978-1-7998-5339-8.ch005

Intelligent Transport System (ITS) is emerging field in research which is used in inter vehicular and vehicle to RSU communication to get updated information about surrounding environment like automatic road enforcement, traffic light sequence and collision avoidance system. For information exchange, ITS used various protocols and accurate positing System (Balon, 2006). For vehicle communication, various standards i.e. WAVE 1609, IEEE 802.11p, IEEE 802.11a, and IEEE 802.11e are used that supports wireless communication between V2V and V2I (Li, Mirhashemi, Laurent & Gao, 2010; Morgan, 2010).

The various factors associated with technology, business, regulation and social behavior, naturally and logically speak in favor of wireless ad-hoc networking. The wireless data communication, which is advancing both in terms of technology and usage/penetration, is a driving force, thanks to the internet and the success of second generation cellular systems (Frodigh, Johansson & Larsson, 2000). In terms of price, portability and usability and in the context of an ad-hoc network, many computing and communication devices such as PDAs and mobile phones, already possess the attributes that are desirable.

An Ad-hoc network is “infrastructure-less “network that does not have any base station. It is a collection of multiple nodes having wireless networking capabilities. It also supports anytime and anywhere computing. There are two types of topologies formed in Ad-hoc network:

- Heterogeneous, which have differences in capabilities.
- Homogeneous or fully symmetric, in which all nodes have identical capabilities and responsibilities.

Adaptive and self-organization are the main feature of ad-hoc network that allow prompt formation and deformation of network. Each node in the network behaves as a router and supports peer-to-peer and peer-to-remote communications. It is cost effective and easy to deploy too. One of the fastest growing domains of interest in ad-hoc networks is the safety, where transmissions are exchanged in order to improve the passengers and driver behavior in Indian automotive networks. In this chapter the basic overview of mobile and vehicular networks is discusses. Its forms the basic idea behind the safety to passengers and drivers. Author discussed their characteristics, significance and performance related to ad-hoc networks.

In the similar manner, the world is witnessing a rapid growth in the cloud computing and their prospective applications in terms of data, storage and processing. The computer and various communication devices can utilize these resources, software and information, on-demand over the internet. The cloud helps us to develop, test and deploy a network centric application for the scalable environment at low cost computing in terms of IP networks (Whaiduzzaman, Sookhak, Gani & Buyya, 2014). The various characteristics of cloud computing is listed below:

- It provides large scale computing resources,
- They are highly scalable in nature,
- They shared a common resource pool,
- It provides dynamic resource scheduling, and
- They are used for general purpose computing.

The cloud system provides their services at three different layers. Figure 1 shows the different layers of the cloud system.

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