An Intense Survey on Cooperative Communication in VNET

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ABSTRACT
Data exchanging on the roads are becoming more and more interesting, as the number of vehicles equipped with computing technologies and wireless communication devices are poised to increase dramatically. The more challenging in vehicular networks, as the nodes can move at high speed in a wide area surrounded of buildings and many other architectural structures which can in turn affect the propagation of the radio signal. Efficient network utilization is a challenging task for wireless applications in cognitive Vehicular Ad-hoc Networks. As a possible solution, cooperative communications, which may increase link capacity by exploiting spatial diversity, has attracted a lot of attention in recent years. we propose a cooperation-based multi hop transmission scheme, that enable path-based cooperative multi hop relaying for vehicular ad hoc networks (VANETs).There are two traditional multi hop relaying schemes, non-cooperative multi hop relaying and hop-based cooperative multi hop relaying, proposed transmission scheme is capable of identified the delivery path if an outage occur in the transmission, thus adapting to the instantaneous channel condition and/or the frequently-changing network topology. our research also consider Sybil attack possibilities in cooperative communication and remove them by identifying attacker node .

We will perform an intense survey in this paper of work done in this area and discuss about future opportunity of improvement in network performance using cooperative communication.

Keywords:- VANET, Cooperative Communication, Multi hop relaying, Hop-based.

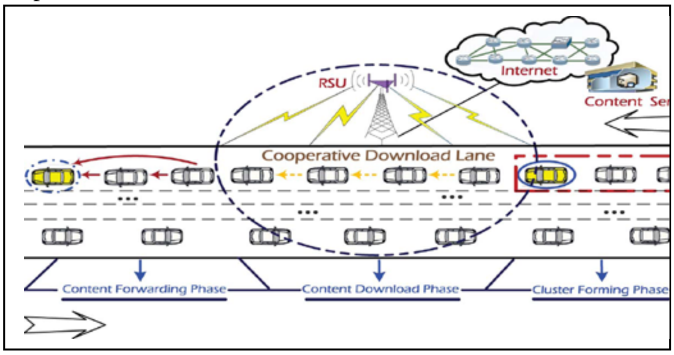
INTRODUCTION

In cellular networks, inherent limitations on cell capacity and cell coverage exist. Due to the capacity limitation, in dense urban areas, such as downtown areas and major events, users tend to experience degraded performance. In the search for ways to enhance network performance, researchers have turned their attention to vehicles on the road. The abundant onboard vehicle resources [1] that are underutilized by traditional vehicular applications offer an opportunity for improved. computing and connectivity in vehicular ad hoc networks (VANETs) [2]. Indeed, with its diverse resources, including sensing, processing, storage, and communication modules, a vehicle can be a potentially excellent candidate as a “mobile relay” to support what we call relaying vehicular networking Ease of Use. We propose the creation of a “cooperative RVC-Net” using vehicles equipped with short- and medium range wireless communication technologies and low elevation antennas. The main reason for using vehicles as relays is to reduce power consumption at the end-user mobile terminal. By reducing the distance between the transmitter and the receiver, the required transmission power is also reduced. Unlike base stations (BSs), relay stations (RSs) are less complex and do not require wired backbone access. In addition, RSs provide higher throughput, increase coverage, lower operational and capital expenditure, allow for faster communication links to roll out, and offer a more flexible configuration. Cooperative RVC-Net can be an integral part of the next-generation cellular network, namely, Long-Term Evolution-Advanced (LTE-A); LTE-A is the de facto fourth-generation (4G) wireless system and is expected to dominate the next generation of wireless networks and to support a wide variety of applications that require higher data rates with more reliable transmission. To meet such demands, wireless communication system designers need to optimize network performance in terms of better link reliability, fewer dropped connections, and longer battery life [3].

Compared with the indoor wireless local area network (WLAN) scenarios, efficient communications in the Drive-thru Internet is a much more challenging task [4], which mainly attributes to the following features of vehicular communications. First, the wireless connectivity from vehicles to RSUs is transitory due to the high vehicle mobility. As reported in [2], the overall connectivity range of an RSU is around 500-600 m, which allows a connection time of 15-18 s to a vehicle moving at the velocity of 120 km/h. In reality, the number of RSUs deployed along the road cannot be enough for providing the ubiquitous coverage due to the high deployment and maintenance cost, particularly in a sparse populated region, e.g., highways. Thus, cooperative inter vehicle communications are typically required accordingly as a supplement to extend the RSU's coverage. Although the cellular networks can also be used to provide mobile network access for vehicles, which is completed coverage. However, the cellular communications are operated on the licensed spectrum, which will be prohibitively costly for transferring bulk data, e.g., video streaming. The RSUs have the advantage of low capital cost, easy deployment, and high bandwidth. Moreover, the RSUs can provide a potential way to offload the cellular networks [5]. Second, the Drive-thru Internet tends typically large-scale with a multitude of vehicles sharing (or contending) the channel simultaneously. For example, as indicated in [6], a stable highway traffic flow typically constitutes 20-30 vehicles per mile per lane. In other words, in an eight-lane bidirectional highway section with smooth traffic flow and a vehicle-to-vehicle (V2V) communication range to be around 300 m, approximately 30–45 vehicles will share the channel for transmissions at the same time. Ott and Kutscher [2] report a real-world measurement of the Drive-thru Internet on a highway road section. With a single vehicle connecting to a roadside IEEE 802.11b AP, a volume of 9-MB data per drivethru can be acquired using either Transmission Control Protocol or User Datagram Protocol at a vehicle velocity of 80 km/h. This allows the download of a medium-sized file, such as an MP3 file. However, when a multitude of vehicles share the RSU for the transmissions synchronously, the individual throughput performance would degrade significantly due to the transmission contentions and collisions and can hardly afford the upper layer applications [7]. Therefore, a practical cooperative mechanism is highly demanded to convert vehicles from channel competitors to collaborators and to enhance the welfare of all vehicles. As motivated by the aforementioned issues, in this paper, we develop a cooperative Drive-thru Internet framework for large volume data distribution to vehicles in the highway environment. Specifically, note that, in the highway scenario, vehicles typically move along a linear topology and drive through the RSU consecutively. Thus, we propose to form vehicles into a chain cluster, so that the cluster members would drive through the RSU consecutively in a sequential order. Each cluster member is responsible to download a non-overlapping part of file, and accordingly with all cluster members moving out the coverage of RSU, an entire file can be downloaded by cluster members but is divided into several parts and separately stored in cluster members. The cluster members then merge the downloaded file to the cluster head. To summarize, Chain Cluster virtually extends the connection time of one vehicle to the collective connection time of a group of vehicles and therefore enhances the likelihood of intact file download during the short-lived connection time. Moreover, Chain Cluster explicitly separates the download phase from RSU from the file merge and recovery phase when the entire cluster leave the RSU coverage. This can fully utilize the precious connection time of vehicles to RSUs. Within the Chain Cluster framework, we develop an accurate and simple analytical framework to evaluate the data volume that could be downloaded for each cluster per drive-thru. In particular, our model investigates on the instantaneous download performance of vehicles by deploying a microscopic vehicular mobility model, as introduced in [8]. With the fundamental IEEE 802.11B Medium Access Control (MAC) applied, we derive the expression of the overall file download time. The major contributions of this paper are threefold. • Cooperation cluster in linear topology: Existing works largely group vehicles in a cluster where vehicles are mutually connected [9]–[11]. In contrast, we form cluster vehicles in a linear chain topology. The linear cluster is not only stable and allows reliable cooperation's among cluster members, but also effective to extend the connection time of a single vehicle to that of multiple vehicles, and therefore boosts the download performance. • Fine-grain mobility model: Existing literature largely adopts the macroscopic mobility [12], [13], which considers vehicles as traffic flows and typically evaluates the averaged performance. Such a method is not accurate enough to evaluate the download performance of a single content file in a specific drive-thru scenario with given neighbouring vehicles and velocity. To address this issue, we apply the microscopic mobility model, which captures the mobility features of a vehicle on highways to provide more accurate evaluation. • Theoretical analysis and performance evaluation: We analyse the collective download performance of vehicles in the linear cooperation cluster on highways. Specifically, we first derive the MAC throughput performance of vehicles with specific mobility features during the drive through of RSU. We then evaluate the integrated data volume that can be cooperatively downloaded by the linear cluster. Finally, we analyse the download forwarding time to retrieve the whole content in the chain cluster. The proposed approach can provide a systematic solution for the adaptive control of upper layer media applications in highway vehicular ad hoc networks (VANETs), such as video streaming.

II RELATED WORK

Cooperative vehicular communications represent an effective approach to extend the RSU's coverage and have attracted an extensive research attention in the past. Various cooperative schemes have been proposed in VANETs accordingly, which can be usually divided into two categories [14], i.e., vehicle to- RSU (V2R) and V2V communications. Our work combines both paradigms together to form a systematic solution for the highway scenario. For cooperative download of large-sized content from roadside infrastructure in V2R communications, Trullols-Cruces et al. [15] consider an urban/suburban scenario, unlikethe highway scenario, where it is hard to predict the contacts between cars. Trullols-Cruces et al. [15] devise the solutions for selecting the right vehicles to carry data chunks and assigning the data chunks among the selected vehicles. To improve the diversity of information circulating in vehicular networks, Zhang and Yeo [16] propose a cooperative content distribution system to distribute contents to moving vehicles via APs' collaboration. Based on the vehicular contact patterns observed by APs, the shared content can be prefetched in the selected representative APs, and the vehicles can obtain the completed data from those selected APs. Saad et al. [17] investigates the cooperative strategy among the RSUs by applying a coalition formation game, which coordinates the classes of data to serve their responsible vehicles. In addition, Liang and Zhuang [18] investigate the utilization of roadside WLANs as a network infrastructure for data dissemination, where the network-level and packet-level cooperation are both exploited.



In terms of cooperative V2V communications, Nandan et al. [19] propose a swarming protocol and a piece-selection strategy to cooperatively exchange the pieces for the same content sharing among different vehicles. Sardari et al. [20] investigates a V2V collaboration scenario for distributing data to sparse vehicular networks, and by applying the rateless coding approach and using vehicles as data carriers, the reliable dissemination performance can be achieved. The authors in [21] address the V2V cooperation issue by introducing a delay-cooperative automatic repeat request (ARQ) mechanism and a vehicular route predictability-based carry-and-forward mechanism. To combat the lossy wireless transmissions and to achieve highspeed content sharing, the symbol-level network coding is adopted in V2V communications. Yan et al. [22] analyze the throughput of cooperative content distribution from RSUs. Due to the observation that the vehicles that are near to the AP have high signal strength, Zhao et al. [23] propose a relay-based solution to extend the service range of roadside APs. In addition, Li et al. [24] design a push-based popular content distribution scheme, where contents are actively broadcasted to vehicles from RSUs and further distributed cooperatively among vehicles. Wang et al. [25] discuss the maximum achievable amount of information that can be relayed forwarding along a vehicular stream. Brandner *et al.* [26] evaluate the packet delivery performance of low complex cooperative relaying by real-world tests. Wang *et al.* [27] introduce a coalitional graph game to model the cooperative vehicles for popular content distribution. In addition, the high mobility, intermittent connectivity, and unreliability of the wireless channel can affect the cooperative performance of VANETs. To satisfy the need for massive data download and forwarding applications and to consider the aforementioned factors, the authors in both [28] and [29] investigate the cooperative MAC protocol in vehicular networks.

III CONCLUSION

In this paper, we have proposed and analysed Cooperative communication scheme for improving the Drive-thru Internet access and V2V Communication improvement. The proposed scheme is a three-phase systematic solution for the Cooperative content download and distribution among high-speed vehicles on highways. microscopic mobility model, jointly considering two realistic mobility rules to analyze the CVN of a tagged download vehicle, which is crucial to evaluate the cooperative download performance in Drive-thru Internet. We have theoretically derived the data download volume by the tagged vehicle per drive-thru, and the results can be extended to multilane highway scenarios.

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