Downloading Process in Road Environments using with Vehicular Networks

B.Nandhakumar[1] R.Bhuvaneshwari[2]
[1]P.G. Scholar [2]Assistant Professor
[1,2]Department of Computer Science and Engineering
[1,2]Selvam College of Technology, Namakkal

Abstract— A complex or non-linear road scenario where users aboard vehicles equipped with communication interfaces are interested in downloading large files from road-side Access Points. To investigate the possibility of exploiting opportunistic encounters among mobile nodes so to augment the transfer rate experienced by vehicular downloader's. To that end, devise solutions for the selection of carriers and data chunks at the APs, and evaluate them in real-world road topologies, under different AP deployment strategies. Through extensive simulations, we show that carry & forward transfers can significantly increase the download rate of vehicular users in urban/suburban environments, and that such a result holds throughout diverse mobility scenarios, AP placements and network loads. The identified and proposed solutions to the problems of carrier's selection and chunk scheduling, and extensively evaluated them. The main contribution of this work lies in the demonstration that vehicular cooperative download in urban environments can bring significant download rate improvements to users traveling on trafficked roads in particular.

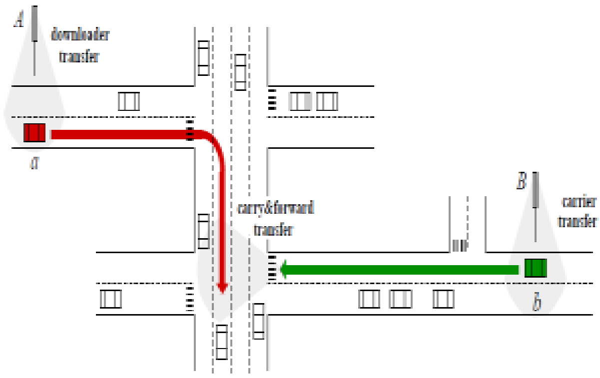
Key words: Vehicular Networks, Vehicular Communication

I. INTRODUCTION

A. *Vehicular Network*

A vehicular adhoc network (VANET) uses cars as mobile nodes to create a mobile network. A VANET turns every participating car into a wireless router or node, allowing cars approximately 100 to 300 metres of each other to connect and, in turn, create a network with a wide range. As cars fall out of the signal range and drop out of the network, other cars can join in, connecting vehicles to one another so that a mobile Internet is created. It is estimated that the first systems that will integrate this technology are police and fire vehicles to communicate with each other for safety purposes.

A vehicular network organizes and connects vehicles with each other, and with mobile and fixed locations resources. Many telematics architectures, including navigation services architecture, traffic information architecture, location-based services architecture, entertainment services architecture, emergency and safety services architecture have been provided. In these architectures, traffic information and navigation services are generally provided by central TSPs (Telematics Service Providers). Emergency and safety services are supplied by an on-board platform, which is likely to be installed by the individual car manufacturers.



Conventionally adopted architectures, telematics architectures are rarely applied in public local hotspots such as public parking lots, hotels, restaurants, airports and shopping centers. In local hot-spot architecture, a vehicle is considered as an alternative mobile computing platform (logically equivalent to a PDA, laptop or a cellular phone) with short-range localized WLAN (Wireless LAN) devices such as Bluetooth and Wi-Fi. This local (hot-spot) architecture allows the car driver to interact with many local services. Telematics architectures will be useful for telematics services only for vehicles providing traditional services such as traffic information, navigation services provided by the central TSP, and local services provided by distributed third-party service providers that can supply the appropriate contextual data. For instance, consider a driver wishing to drive a car to a convention center. The driver initially finds routes to the center using a navigator, then selects a route free from traffic jam based on traffic information from a TSP. The car automatically discovers the resources of the convention center, obtains directions to the designated parking lot, and makes associated payments using the WLAN communication, as it enters the premises. The driver can obtain various local services provided by the convention center even before stepping out of the car.

Vehicles traveling within cities and along highways are regarded as most probable candidates for a complete integration into mobile networks of the next generation. Vehicle-to infrastructure and vehicle-to-vehicle communication could indeed foster a number of new applications of notable interest and critical importance, ranging from danger warning to traffic congestion avoidance.

II. SYSTEM DESIGN AND ANALYSIS

A. *Existing System*

The cooperative download of contents from users aboard vehicles that introduced SPAWN, a protocol for the retrieval and sharing of contents vehicular environments. SPAWN is designed for unidirectional traffic over a highway, and is built on the assumption that all on-road vehicles are active downloader's of a same content.Applications of vehicular communication abound, and range from the updating of road maps to the retrieval of nearby points of interest, from the instant learning of traffic conditions to the download of touristic information and media-rich data files. This will induce vehicular users to resort to resource-intensive applications, to the same extent as today's cellular customers Most observers concur that neither the current nor the upcoming cellular technologies will suffice in the face of such a surge in the utilization of resource-demanding applications. Recent network overload episodes incurred in by cellular infrastructures in presence of smartphone users provide a sobering wake-up call. To wit, a recent analysis on the traffic of a large US-based operator shooed that smartphone users represent just 1% of the total subscribers, yet drain 60% of the network resources.

The Connected forwarding and carry-and-forward are inherently multi-hop paradigms. To assume that vehicular users are rational; hence they can be engaged in relaying traffic for others only if they are not currently retrieving the content for themselves. Furthermore, since our goal is to derive an upper bound to the system performance, to assume the availability of preemotive knowledge of vehicular trajectories and perfect scheduling of data transmissions. This is a common assumption for vehicular nodes, while the extension to the case where APs have more than one interface is straightforward. The nodes share the channel bandwidth allocated for service applications using an IEEE 802.11-based MAC protocol. Our objective is to design the content downloading systems as to maximize the aggregate throughput. To this aim, To have to jointly solve two problems given a set of candidate locations and a number of APs to be activated, To need to identify the deployment yielding the maximum throughput given the availability of different data transfer paradigms, possibly involving relays, To have to determine how to use them in order to maximize the data flow from the infrastructure to the downloaders. Our approach consists in processing abroad layout and an associated vehicular mobility trace, so as to build a graph that represents the temporal network evolution.

1) Disadvantages

- Low Network Capacity.
- Access only simple files not large files.
- There are not having the good carry and forward transmission.

B. Proposed System

The identified and proposed solutions to the problems of carrier's selection and chunk scheduling, and extensively evaluated them. The main contribution of this work lies in the demonstration that vehicular cooperative download in urban environments can bring significant download rate improvements to users traveling on trafficked roads in particular. The proposed framework based on time-expanded graphs for the study of content downloading in vehicular networks. Our approach allows to capture the space and time network dynamics, and to formulate a max-flow problem whose solution provides an upper bound to the system performance. Through a graph-sampling technique, to solved the problem for realistic, large-scale traces. Simulation results shoTod that the physical and MAC layer assumptions on which the framework relies have a minor impact, leading to a tight upper bound.

Fig. 2.2(a): Downloading the Files

The major findings in our analysis are as follows two regimes, characterized by different performance and impact of the system settings, emerge at different technology penetration rates. In an urban scenario, the watershed arises when 20-30% of the vehicles participate in the network. The contribution of V2V communications remains relevant even under a pervasive AP deployment and in both penetration regimes, as optimal scheduling tends to favour high rateV2V transfers over low-rate I2V communications. Knowledge of user mobility is paramount to the system performance, since most of the V2V traffic relaying takes place through the carry-and-forward paradigm.

Fig 2.2(b): Transferring the Data

As a consequence, the goal is not to study information dissemination or cooperative caching, but to investigate the performance of content downloading.

1) Advantages

- Improve the network capacity.
- Download large-sized files.
- There are good carry and forward transmission.
- Cooperative downloads the large sized.

C. Modules

1) Cooperative Download

Let us first point out which are the major challenges in the realization of a vehicular cooperative download system within complex urban road environments. The selection of the carrier(s) contacts between cars in urban/suburban environments is not easily predictable. Idle APs cannot randomly or inaccurately select vehicles to carry data chunks, or the latter risks to be never delivered to their destinations. Choosing the right carrier(s) for the right downloader vehicle is a key issue in the scenarios to target.

The scheduling of the data chunks determining which parts of the content should be assigned to one or multiple carriers, and choosing in particular the level of redundancy in this assignment, plays a major role in reducing the probability that destination vehicles never receive portions of their files.

2) Chunk Scheduling

Upon selection of a destination for the carry & forward transfer, jointly with the associated local carriers, an AP must decide on which portion of the data the downloader is interested in is to be transferred to the carriers. To that end, To assume that each content is divided into chunks, small portions of data that can be transferred as a single block from the AP to the carriers, and then from the latter to the destination. Since a same chunk can be transferred by one or multiple APs to one or more carriers, the chunk scheduling problem yields a trade-off between the reliability (the probability that a downloader will receive at least one copy of a chunk) and the redundancy (how many copies of a same chunk are carried around the road topology) of the data transfer.

a) Global

The Globalchunk scheduling assumes that APs maintain per vehicle distributed chunk databases, similar to the time databases introduced before. These databases store information on which chunks have already been scheduled for either direct or carry & forward delivery to each downloader.

b) Hybrid

The Hybrid chunk scheduling allows overlapping between carry & forward transfers scheduled by different APs.

c) Local

The Local chunk scheduling is similar to the Hybrid scheme, since different APs can schedule the same chunks when delegating data to carriers.

3) AP deployment

a) Random

Under the Random AP positioning scheme, each point of the road topology has the same probability of being selected for the deployment of an AP. The resulting placement may be considered representative of a completely unplanned infrastructure.

b) Density-based

The Density-based AP deployment technique aims at maximizing the probability of direct data transfers from APs to downloader vehicles. To that end, this technique places the APs at those crossroads where the traffic is denser.

c) Cross volume-based

The Cross volume-based AP placement is designed to favour carry & forward transfers, by increasing the potential for collaboration among vehicles. This technique exploits the predictability of large-scale urban vehicular traffic flows, which are known to follow common mobility patterns over a road topology.

d) Overlapping AP coverage's

Given the beneficial effect of additional APs when d is high, to study the impact of a further infrastructure extension by allowing AP coverage's to overlap. Compares the throughput and V2V download fraction obtained when non-overlapping and overlapping AP coverage's are allowed. The results have been obtained for a relatively high downloading demand, namely, d = 0.05. When overlapping among AP coverage's is not allowed, only 60 candidate locations can be considered. Conversely, such a number grows to 90 when the coverage of any two candidate APs can overlap. Observe that, for a fixed number of APs, the possibility to have overlapping coverage's leads to a marginal improvement in the per-downloader throughput. The reason for this behavior is once more that the V2V traffic relaying tends to compensate for the lack of flexibility of the non-overlapping deployment.

e) Delay tolerant networks (DTNs)

The vehicular cooperation paradigm that to consider relates our work to DTNs. In particular,] assesses the benefit to content dissemination of adding varying numbers of base stations, mesh nodes and relay nodes to a DTN, through both a real tested and an asymptotic analysis. A DTN time-invariant graph, which is similar to the time-expanded graph used in our study, was presented With respect to do not assume the contacts between mobile nodes to be atomic but to have arbitrary duration, and To build the network graph so as to account for the presence of roadside infrastructure and channel contention. The representation of a time-varying network topology as a time-expanded graph can be found over a road topology.

f) Transfer paradigms

Resulting from a direct communication between an AP and a downloader. It represents the typical way mobile users interact with the infrastructure in today's wireless networks connected forwarding, traffic relaying through one or more vehicles that create a multi-hop path between an AP and a downloader, where all the links of the connected path exist at the time of the transfer. This is the traditional approach to traffic delivery in ad hoc networks

g) Privacy-Preserving Authentication Process

Use a Hash Message Authentication Code (HMAC) to avoid time consuming CRL checking and to ensure the integrity of messages before batch group authentication. HMAC checking cannot only authenticate the message source but also check the integrity of messages.

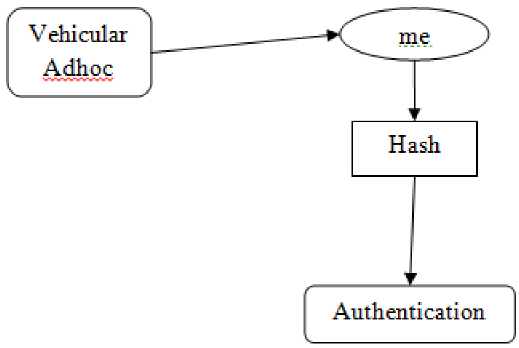


Fig. 3.5(a): Architecture Diagram

It is a simple graphical formalism that can be used to represent a system in terms of the input data to the system, various processing carried out on these data, and the output data is generated by the system. It is common practice to draw the context-level data flow diagram first, which shows the interaction between the system and external agents which act as data sources and data sinks. This helps to create an accurate drawing in the context diagram.

The system's interactions with the outside world are modelled purely in terms of data flows across the system boundary. The context diagram shows the entire system as a single process, and gives no clues as to its internal organization. With a data flow diagram, users are able to visualize how the system will operate, what the system will accomplish, and how the system will be implemented. The old system's dataflow diagrams can be drawn up and compared with the new system's data flow diagrams to draw comparisons to implement a more efficient system.

Data flow diagrams can be used to provide the end user with a physical idea of where the data they input ultimately has an effect upon the structure of the whole system from order to dispatch to report. How any system is developed can be determined through a data flow diagram model. A DFD shows what kinds of information will be input to and output from the system, where the data will come from and go to, and where the data will be stored. It does not show information about the timing of processes, or information about whether processes will operate in sequence or in parallel.

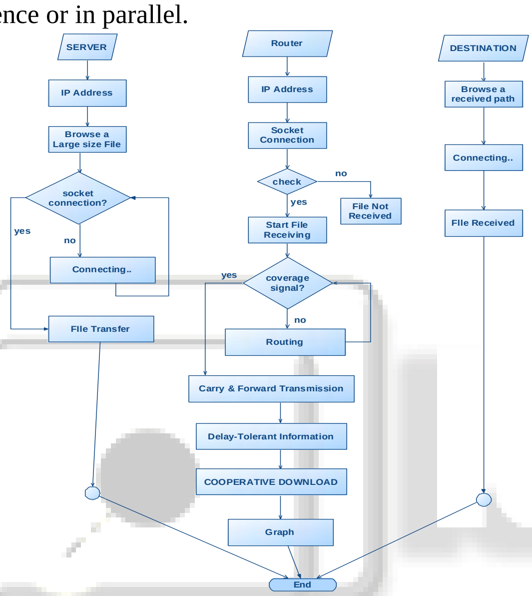


Fig. 2.6(a): Flow Chart for Vehicular Network

III. CONCLUSION

Conclusion presented a complete study of cooperative download in urban vehicular environments. To identified and proposed solutions to the problems of carrier’s selection and chunk scheduling, and extensively evaluated them. The main contribution of this work lies in the demonstration that vehicular cooperative download in urban environments can bring significant download rate improvements to users traveling on trafficked roads in particular.Since our study is, to the best of our knowledge, the first of its kind, a number of research directions remain to be explored before cooperative downloading systems can be deployed in urban areas.

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