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CONTENT DOWNLOADING IN VEHICULAR NETWORK: INCREASING PERFORMANCE BY MAXIMIZING THROUGHPUT

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Abstract- **In this paper we describe about the vehicular network, in which vehicles and Road Side Units (RSU) are the communicating nodes. Here we consider a system where users aboard communication enabled vehicles which are interested in downloading various data services from internet based servers. This process observes many of the infotainment services that vehicular communication is envisioned to enable, like information of nearby vehicles to avoid accidents, to identify the name of the present location through search engines, software updating, radio services etc. Aim of this paper is to model the process so as to optimize the performance limits of the vehicular downloading system and maximize system throughput. For this purpose this paper allows investigating impact of various factors, like road side infrastructure deployment, the vehicle-to-vehicle relaying and penetration rate of the communication technology, in the existence of two operational regimes at various penetration rates the importance of an efficient, yet 2-hop constrained, vehicle -to-vehicle relaying.**

I. INTRODUCTION

The existence of Internet-connected navigation and information-based media content systems are becoming a truth which will easily lead to a remarkable growth in bandwidth demand by in-vehicle users. As we know that communication-enabled vehicles shows interested in downloading different multimedia contents from Internet-based servers. This vehicular system will induce the vehicular user to use the resource to the same extent as today's mobile customers. In turn this system captures many of the entertainment services by effectively with effective information, such as navigation maps, news reporting service, and also software updating, or multimedia content downloading. This vehicular system's network architecture has to support more number of vehicles. One possibility this problem is to offload part of the traffic to Dedicated Short-Range Communication (DSRC), through direct infrastructure-to-vehicle (I2V) transfer, as well as vehicle-to-vehicle (V2V) data relaying. In traditionalapproachesboth infrastructure-to-vehicle and vehicle-tovehicle communication will be taken place. Now the major objective is to maximize the overall system throughput; we
nowformulate the max-flow problem that will take in to account for several practical aspects as channel contention and also the data transfer paradigm. Finally as a result, we obtained content downloading of Multimedia in vehicular networks by the vehicles has thus received increasing attention overall from the research community.

II. RELATED WORK

Earlier studies focus on the feasibility of using IEEE 802.11p Access Points to inject data into vehicular networks, as well as on the connectivity challenges posed by such an environment. Here random distribution of APs over the street layout can help routing data in vehicular ad hoc networks. The impact of several AP deployments on delay-tolerant routing among vehicles is studied. The strategies of placing Road side infrastructure are proposed so as to maximize the amount of time a vehicle is within radio range of an Access Point.
From the previous work from authors U. Paul, M.M. Buddhikot, A.P. Subramanian, and S.R. Das were formulated that the overall measurement analysis of particular network resource deployment and also the subscriber activitiesthat uses a large-scale data set accumulated within a nationwide 3G cellular network. Now data set keeps close to several number of subscribers over thousands of base stations. Also they examine the capability of network resources that can be used by several subscribers on the other hand by different applications. Finally they find out the traffic in vehicular network from the point of view of the

base stations and started to analyze the temporal as well as spatial variations in various kinds of the vehicular network.

Next to that work some of the authors study that relates to the cooperative downloading in vehicular networks. The vehicular cooperation paradigm that we consider relates our work to Delay tolerant networks (DTNs). A DTN time-invariant graph, which is similar to the time-expanded graph used in our study. By their context, the work in [11], [12] tells that a vehicular peer-to-peer file sharing protocol, lets the vehicles to share particular confined content of common interest. Also their studyon content download, instead, works in the more systematic manner in the case that shows the each user is very much interested in a different file. Finally systemassumptions identical to the ones made in [11], [12] are behindthe works in [13] about which, as a consequence, thesame considerations hold.

III. SYSTEM MODEL AND ASSUMPTIONS

For analysis purpose we had tocreate a network that is composed of fixed roadside APs and vehicular users, in those some of them are downloader's. As result point of view they are interested in downloading multimedia content from the Internet through the APs.

A. DYNAMIC NETWORK TOPOLOGY GRAPH

Dynamic network topology graph (DNTG) generate a from a different vehicular mobility trace in network topology, considering that on the corresponding road layout there are: (i) a set of A candidate locations (a_i = 1,. ,A) where APs could be placed (ii)a set of vehicles (V_i= 1, . . . , V) travel over the road layout (iii) a set of D vehicles that wish to download data from the APs.

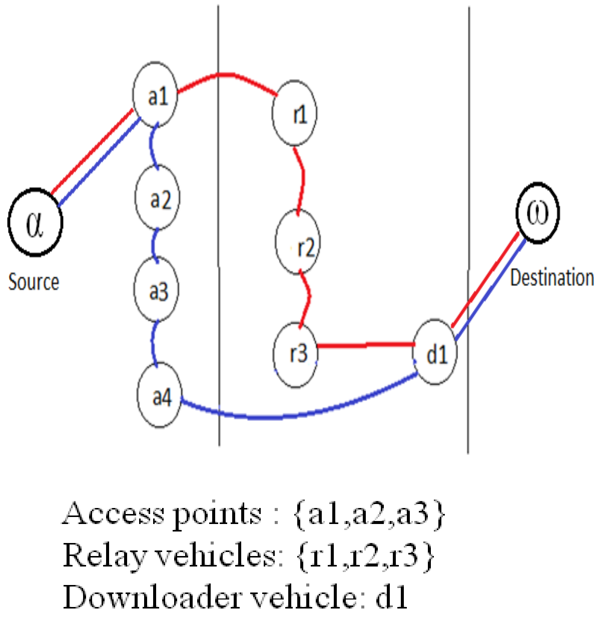


Fig 1: Dynamic Network Topology Graph

Figure1. A sample DNTG, with one Access point a1,a2,a3,a4 and four vehicles r1, r2,r3 & d1. The vehicle (d1) is a downloader which is downloading data for that particular movement, while the others vehicles (r1, r2, r3) can act as relays. In the above graph, we show up paths that are agent of the carry and-forward (A), connected forwarding (B), and direct transfer (C) paradigms. Ourmajor intension of this topology graph isto model all possible findings through which particular data can flow from direct APs to the downloader's or through relays. So with known mobility trace, we can identify the contact events between any pair of thenodes that of V2I/V2V.

Each contact event is characterized by:

- Link quality, It is the quality of the link established between the two nodes; moreover, the achievable datatransfer rate at the network layer, only depends on the distance between the feasibility of two nodes.
- The contact starting time, It is the time at which the link between the two nodes is established oralready established link already consists of quality level with update value;

A contact ending time, it is the time at which, particular quality level of the link has altered when the linkis removed or discarded

Generally time interval between any of the two contactevents in the network is termed to be frame. We also say that with in a frame the network is static, i.e., the link quality levels do not alterthat means no link is thus created or removed or no contact event finally established.

Herewe consider the number of frames by F, and also duration of the frame to be k ($1 \leq k \leq F$) by k; also, all constant contact events during every frame k are said to be active that of the same frame only. Now vehicle shares in the network at frame k islabelled by a vertex ($1 \leq i \leq V$) as shown in above graph, so that each candidate AP location is mapped in each frame k onto a vertex A_i^k ($1 \leq i \leq A$). We now denote byV^k andA^k . Within each frame k, a directed edge ($V_i^k \in V_j^k$) exists fromvertex$V_i^k \in R^k$to vertex $V_j^k \in V^k$ if a contact between thenon-downloader vehicle V_i and another vehicleV_j is active during that frame. Each edge of this frame type is associated with a weight w (V_i^k, V_j^k) equal to the rate of that corresponding contact event. The set having such edges is denoted as L_v^k .

B. THE MAX-FLOW PROBLEM

With the above topology graph, our next step is to formulate the optimization problem the maingoal of this problem is to maximize the flow from to , i.e., the total amount of datadownloaded by the downloader's. Denoted by x (V_i^k, ω) the traffic flow over an edge connecting two generic vertices, our intention can be expressed as:

$$\boldsymbol{max} \sum_{k=1}^{F} \sum_{V_i^k \in D^k} \boldsymbol{x}(V_i^k, \omega)$$

Generally max-flow problem needs to be solved by considering into account many constraints such as, maximum number of APs that have to be activated, channel access, non-negative flow as well as flow conservation. Wegive detailof such constraints below follows.

a) Constraints

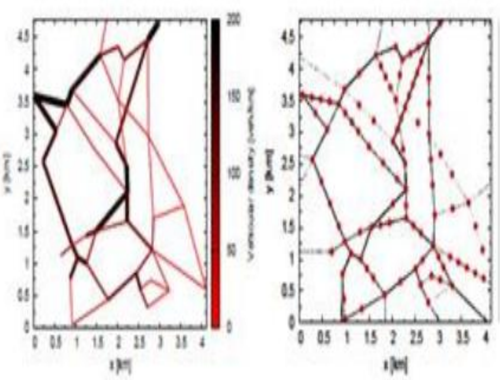
Non-negative flow and flow conservation: it is termed to be the flow on each existing edge so thatDNTG mustbe always greater than or equal to zero. So therefore for any vertex in the graph, the distributed amount of ingoing flow intothe vertex should equal the amount of outgoing flow.

Channel access: In general point of view of the we consider an IEEE 802.11-based MAC scheme that supports RTS/CTS and we consider only unicast transmissions, among two or more of the following events cannot take place at same time for a tagged vehicle, and that of time duration of each frame must be equally shared among the tagged vehicle:

1) Vehicle transmits to that of a neighboring vehicle;
2) Considerer the neighboring vehicle receives only from any relay;
3) Now vehicle receives data from a neighboring relay;
4) Thus neighboring relay only transmits to any type of vehicle;
5) So that vehicle receives from any a neighboring AP;
6) Finally neighboring AP transmits to any vehicle.

IV. DERIVING DESIGN GUIDELINES

As shown above consider a real-world road topology, so that it covers an area of $10km^2$especially in the urban area. Now vehicular mobility trace in the region has been virtually generated at urban area, through a multi-agent microscopic traffic simulator.



(a) Vehicular density over space (b) AP candidate locations

Figure2. Simulation scenario: (a) road layout and average density of vehicles computed over a whole day; (b) giving out of the AP candidate locations over the road layout.

As depicted in Fig. 2(a), we explain the road layout that shows the different traffic methodology observed in each road layout.

Speaking generally we consider a conventional VANET technology penetration rate, in which only a small fraction of the vehicles in the network, namely 20%, is equipped with a communication interface or immediately communication device so thatit is ready to participate in the content downloading process, either as relays or as downloader's. we also shows,the number of vehicular downloader's that parallely request that content is assumed to be only 1% of the vehicles participating in the network.

So therefore AP locations are particularly selected across the roads so that the distance between two adjacent APs is slightly near to the value 150 m, gives in 92 candidate locations, depicted in Fig. 2(b). Finally the value of achievable networklayer rate considered between any two nodes is reduced according to the distance between them.

IV. IMPLEMENTATION

In addition to the investigation of several factors such as Access point deployment, a vehicular network is developed using C# programming language. This implementation involves data transfer paradigm between source and destination. The GUI of that netwotk is shown in fig3.

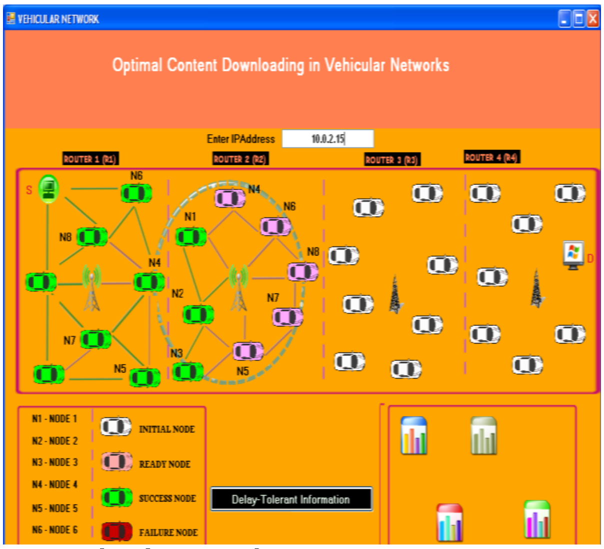


Fig 3: Vehicular network

After complete transfer of data from source to destination you can able to view information total time, average time at each Access point. That information is shown in fig4.

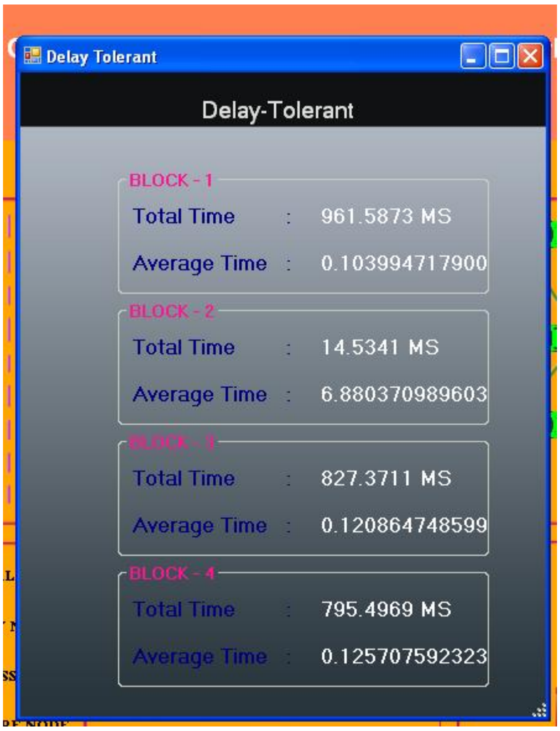


Fig4: Delay tolerant information

V. VEHICLE DENSITY BASED ACCESS POINT DATA DOWNLOADING

To explain further Vehicle density is to be calculated depend on previous temporal changes and the updated vehicle density is calculated. So that the access points' capabilities are adjusted so that make it works more in high vehicle density environment and works very less in low vehicle density environment.

VI. THROUGH PUT

The observations resulted that if we are having 2-hop connectivity than multi hop connectivity, will lead to high flow of data. The through put will be 2 or 3 times higher in rural, that is in less dense area, if there is planned deployment of Access Points at the time of initialization, and there will be limited effect of further deployment of AP, after that point. Where as in urban areas, where there are more number of communication enabled vehicles, Access point deployment will have o greater effect because it is mature network, the communicating vehicles will make use of relay vehicles instead of Access points. So we can deploy access points in less number and in random way to increase through put and to minimize cost.

VII.CONCLUSION

We observed crucial factors affecting the performance of the content downloading process in the vehicular networks, by determining and also solving a max-flow problem for a time extended graph that employs a true vehicular trace. The important findings in our system are as follows:

- Our major thoughts are an density-based AP deployment results in performance close to the nearest and accurate result, as that of multi-hop traffic delivery is more valuable, even though the gain is ignored beyond two hops from the AP.
- Similarly access points' capabilities are so tuned,in turn it works more in high vehicle density environment and works very less in such low vehicle density environment.

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