Robust Diffusion of Video Using Streaming Urban Video in VANET'S

K.Sharmila and M.Vijayaraj
Department of Computer Science and Engineering,
Mohamed Sathak Engineering College, Kilakarai, Tamil Nadu, India
krishpasweety@gmail.com

Abstract - **Vehicular ad hoc network is not efficient to support the transformation process of multimedia streaming. Broadcast and Multicast in adhoc network facing the problem of highly dynamic topology of Vehicular network and the strict delay requirements of streaming application. Inter vehicular communications called Streaming Urban Video, which is fully distributed and dynamically adapts to topology changes, and leverages the characteristics of streaming applications to yield a highly efficient, cross-layer solution.**

Keywords - **Vehicular networks, Streaming video**

I. Introduction

Any kind of data transfer in a VANET, because nodes are not fixed but can move. Furthermore, other complications can easily arise because, unlike the well known mobile ad-hoc networks, where nodes can freely move in a certain area, in VANETs, vehicles' movements are constrained by streets, traffic and specific rules. The distribution of video streaming traffic from one source to all nodes in an urban vehicular network is the major problem in VANET. Vehicular ad hoc network is not efficient to support the transformation process of multimedia streaming. Broadcast and multicast to transfer the multimedia which is facing the problem of delay in communication and topology changes. Broadcast communication used to transfer the video streaming for all nodes in ad hoc network. Multicast communication is used to forward the information in a network to specified participants.

The process of transformation in VANET doesn't support the video streaming which leads to the delay in communication, worst bandwidth. To overcome this problem SUV protocol is proposed for the communication between the nodes in ad hoc network for efficient video streaming transformation. SUV used as a fully distribution protocol which provides the unbroken communication or transmission of multimedia streaming. In this work, we propose a fully distributed solution called Streaming Urban Video (SUV) that efficiently disseminates streaming video to all vehicles in a city VANET. SUV completely relies on intervehicular communication: a video stream, generated in a point in space (e.g., at a roadside access point), is fed to SUV nodes and disseminated across the VANET through a distribution structure, which is laid over the physical topology of mobile nodes. We refer to the nodes that belong to the distribution structure and are responsible for the forwarding of the streaming video as relay nodes. Streaming video distribution in SUV therefore occurs through a mix of local broadcasting from a relay node to its neighboring nodes and MAC-layer multicasting from a relay node to its next-hop relay nodes. Whenever a collision occurs, SUV fit out the properties of video coding to design a collision- resolution mechanism. MAC layer protocol is proposed to detect a collision by means of passive acknowledgments. To efficiently schedule the transmission of relay nodes, and thus minimize the chance of collisions, we derive some results from graph-coloring theory and apply them to the distribution structure.

The remainder of the paper is organized as follows: We introduce the system model in Section 2. The SUV scheme is detailed in Section 3 as a fully distributed solution spanning several layers from the application to the MAC layer. In Section 4, by using graph coloring theory,we derive a scheduling algorithm that 1) is specifically designed for our scenario and 2) aims at maximizing the distance between the closest pair of nodes that simultaneously access the same radio resources. We also mention that a study of the performance of SUV against theoretical results for broadcast capacity in multihop networks, as well as of its suitability to support video streaming in a realistic vehicular scenario, can be found in [6].

II. Vanet Model

VANET deployed in an urban environment. We make no assumptions on the vehicle density since; SUV can achieve a good performance even with spotty, volatile vehicular connectivity. One or more gateway nodes, either fixed or mobile, provide streaming video to car passengers. Examples of streaming video include news,tourist information, commercial advertisements, football games, or music video clips. Distribution of multimedia content relies on intervehicular communication; in addition, vehicles may wish to exchange best-effort data traffic in a peer-to-peer fashion: news summaries, public transportation timetables, traffic warnings, and so on. As in , we define the node transmission range as the maximum distance at which the expected packet error rate is still acceptable, namely, equal to 0.08 as in the 802.11 standard, and we denote the corresponding received power level . This power level, measured in dBm, depends on the node wireless interface and data rate. Also, all network nodes are supposed to be equipped with a positioning system, such as GPS, so that they are aware of their location and accurately synchronized in time. Each vehicle periodically broadcasts an in-band HELLO signaling message, which carries the sender's ID and GPS position. A vehicle can therefore keep 1) an updated list of its 1-hop neighbors, i.e., the nodes from which it receives a HELLO with power level that is equal to or greater than, and 2) the position and the power level received from each of its 1-hop neighbors.

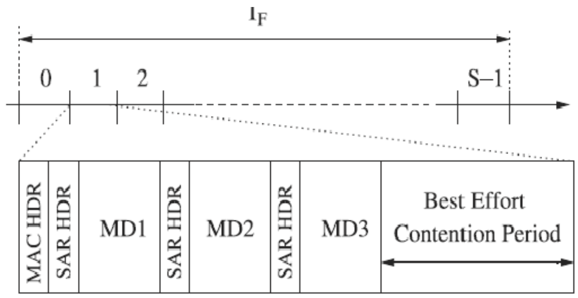

Fig. 1. Data channel access: time frame structure and an example of slot usage with three video descriptors (MD1, MD2, and MD3).

Streaming video and best-effort traffic (the latter including HELLO messages) are transmitted over a data channel, which is organized according to a TDMA structure. The data channel is structured in fixed length time frames of duration TF. Each time frame is further divided into S identical slots, where the values of S, as well as the subset of relay nodes that transmit in each time slot. The multimedia content is assumed to be a video sequence. Note that various video coding techniques have been defined to allow streaming video to withstand the potentially harsh conditions of wireless networks Here, we the video to be encoded into three descriptors although other techniques could be considered as well. Each descriptor is composed of several video frames (e.g., I, B, or P) of different size. The node protocol stack includes a Segmentation and Reassembly (SAR) layer, such that, at the transmitter, each video frame is segmented (if needed) and formatted into a packet that will cover up to one third of a MAC payload of maximum size. In other words, every MAC packet to be transmitted in a time slot carries three (or parts of three) video frames, each corresponding to a different descriptor. The SAR header also carries the video frame sequence number. At the receiver, the SAR layer reassembles (if both necessary and possible) different parts of the same video frame and send the video frame to the upper layers. Due to the VBR nature of video traffic, I frames are typically very large, while P frames are small. This implies that when an. I frame needs to be transmitted, one or more slots will be filled up; when, instead, P frames are sent, a large portion of the slot will remain free and can thus be reused for best-effort traffic.

III. The Suv Protocol

It is commonly acknowledged that mobile ad hoc networks, and, in particular, Vehicular Ad Hoc Networks (VANETs), are ill-suited to support multimedia traffic. Low bandwidth, fleeting connectivity, and highly-dynamic, unpredictable topology are the main shortcomings hindering the support of real- time applications. The variable bit rate (VBR) nature of the traffic, the highly dynamic topology and the strict delay constraints, making no allowance for store-and-forward, pose a different problem from the ones previously addressed in broadcast ad hoc networks. The issues related to the support of video streaming in VANETs have been previously addressed in. The network architecture in aims at propagating video streaming through forwarding nodes, in a highway scenario; however, unlike our case, the solution is tailored to traffic delivery from multiple sources to a single receiver. The work in proposes an application-layer approach to deliver live video streaming, by exploiting a cluster-based network topology, in a highway environment. Although clustering is a viable approach for video distribution, the control traffic overhead for creating and maintaining the cluster structure may be significant, especially in highly-mobile scenarios. The study in analyzes a slot– based scheme for delivery of streaming traffic, again, in a highway environment. Finally, relevant to our work is also, where some sensor nodes are selected as traffic forwarders and their transmissions are scheduled according to a TDMA scheme.

Selection of relay nodes so as to maximize the coverage area,
Scheduling of relay nodes in TDMA fashion,
Scheduled access for streaming video,
Opportunistic access for streaming video,
Contention-based access for best-effort traffic.

A. Dynamic Children Selection

The relay node will therefore partition the surrounding space in four identical sectors at 90 degrees of each other; ideally, near the center of one of them its parent sits (parent sector). Near the center of the remaining three (children sectors), the relay node will look for nodes who are eligible to be children. The "sector center" in my case is a point on the bisectrix of the angle formed by sector borders, and at a distance that satisfies two conflicting requirements: 1) close enough that radio reception is not impaired and 2) far enough from the relay node to minimize co channel interference with other nodes scheduled in the same slot, while maximizing stream special advancement. The orientation of the four-sector space may be chosen in several ways; one of the most efficient choices is the following: the orientation of each sector is deterministically chosen so that its bisectrix points toward one of the four cardinal points.

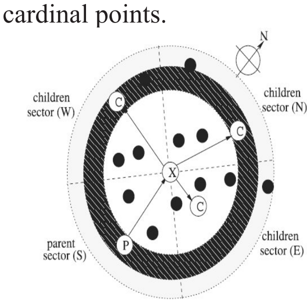

Fig. 2 Orientation of the four sector space

In this paper, for every packet generated at the MAC layer, the gateway undertakes a set of actions with the purpose of identifying up to four relay nodes. The same set of actions is then undertaken by each of the relays thus selected with the purpose of selecting up to three more relays. Each newly selected relay repeats the procedure until either a relay node cannot find any schedulable neighbors, or the relay is asked to forward slot content with a video frame sequence number that is smaller or equal to the one previously received. The set of relays thus selected represents the distribution structure that is in charge of forwarding the content.

B. Channel Access Rules: Scheduled Access for Streaming Video

Number of bits of each descriptor.
Identity of the three children.
Slot number in which each child is scheduled.

No transmission is heard during the time slot: the relay node will try an "on-the-fly" rescheduling of the missing child within the same slot.

A garbled transmission is received: the relay node assumes it did not receive it because of concurrent neighboring transmissions that only affected its own reception; the relaying is considered successful and no rescheduling is deemed necessary.

A correct transmission is decoded, but its source is not the scheduled child: the scheduled child may have successfully received the transmission and then lost a children conflict. No action is taken since the slot is occupied.

A correct transmission by the scheduled child is decoded, but the video frame has a higher sequence number than the one transmitted by the relay: this situation may arise if the child is scheduled by two or more relay nodes at different levels in the distribution tree.

In this paper, the relay node gives up its own parent role toward that child and waits to be scheduled by it in the next time frame, thus receiving the more recent stream feed. Recursively, the more recent copy of the stream will worm its way outward at the expense of the older copy of the stream.

C. Channel Access Rules: Opportunistic Access for Streaming Video

Opportunistic access within a time slot occurs in the following situation: a relay node does not hear one of its children using the slot where it was scheduled for transmission. Likely, a node close to the silent child has collided with the relay node transmission. The relay node then will try and start a contention procedure to claim the slot and, at the same time, to salvage its latest transmission by sending one or two out of the three (parts of the) multiple-description video frames. The time slot is therefore used as follows:

- a grace period (similar to IEEE 802.11 DIFS) needed to declare the medium as idle,
- an RTS/CTS exchange between the relay node and the silent child to reclaim the slot,
- a leftover period carrying the transmission of one or two (depending on the length of the RTS/CTS exchange) of the multiple descriptors.

The RTS/CTS exchange provides for contending relay nodes to claim the leftover slot through a slotted Aloha procedure [13]. After sending the RTS, if the contending relay node hears a CTS addressed to itself, it will use the leftover slot time to transmit two out of three of the descriptors.

D. Channel Access Rules: Contention-Based Access for Best-Effort Traffic

If a time slot is underutilized, i.e., a relay node cannot fill up the time slot with the streaming video available at the time of transmission, the residual slot time is allocated to contention- based access. The sender is assumed to advertise the slot portion that it is about to use through a MAC header field. All nodes within the radio range of the transmitter are entitled to contend for the residual slot time, provided they correctly decode the slot occupancy indication. A node willing to transmit must first perform a postbackoff as in standard 802.11 DCF and, if the residual slot time at the end of postbackoff is sufficient for the transmission of at least one minimum-size data packet, it accesses the medium as in DCF.

IV. Grid Coloring

We now describe the procedure to dimension the scheduling of relay nodes in SUV. We draw on the fact that the network topology composed of relay nodes has a grid-like structure. We first consider a regular grid topology, i.e., every node has two neighbors along each spatial dimension and that neighboring nodes are all at the same distance R from each other. Under such a network scenario, we formulate the scheduling problem and provide a solution that is proven to be optimal for all cases of practical interest. The obtained scheduling scheme is then applied to a realistic VANET, where, in general, the distance between relay nodes is shorter than R and relays form an irregular grid.

V. Conclusion and Future Enhancement

SUV used as a fully distribution protocol which provides the unbroken communication or transmission of multimedia streaming. The communication between the participants in the network depends on their rely nodes, the distribution of video streaming involved about centralized server or authenticator of the network .Collision in the network means discard of distribution process without fulfill its given process which means rejection of communication without reaching the destination node. It's necessary to recollect the ejected stream to complete the full process. Recollection of dropped packets is must to fulfill the successful communication.

References

[1] Fabio Soldo, Claudio Casetti, Carla-Fabiana Chiasserini,and Pedro Alonso Chaparro, "Video Streaming Distribution in VANET's" *IEEE Parallel and Distributed System,* July 2011

[2] F.J. Ros, P.M. Ruiz, and I. Stojmenovic, "Reliable and Efficient Broadcasting in Vehicular Ad Hoc Networks," *Proc. IEEE Vehicular Technology Conf.* (VTC) Spring 2009, pp. 1-5, Apr. 2009.

[3] W. Chen, R.K. Guha, T.J. Kwon, J. Lee, and Y.-Y. H. Wirel, "A Survey and Challenges in Routing and Data Dissemination in Vehicular Ad Hoc Networks," *Wireless Communications and Mobile Computing,* Oct. 2009.

[4] M. Guo, M.H. Ammar, and E.W. Zegura, "V3: A Vehicle-to-Vehicle Live Video Streaming Architecture," *Proc. IEEE Int'l Conf. Pervasive Computing and Comm. (PerCom),* pp. 171-180, Mar. 2005.

[5] M. Bonuccelli, G. Giunta, F. Lonetti, and F. Martelli, "Real-Time Video Transmission in Vehicular Networks," *Proc. IEEE Mobile Networking for Vehicular Environments (MOVE Workshop)*, pp. 115-120,May 2007.

[6] Y.-C. Chu and N.-F . Huang, "Delivering of Live Video Streaming for Vehicular Communication Using Peer-to-Peer Approach," Proc. *IEEE Mobile Networking for Vehicular Environments* (MOVE Workshop), pp. 1-6, May 2007.

[7] F. Soldo, C. Casetti, C.-F. Chiasserini, and P. Chaparro, "SUV: Related Work and Performance Evaluation," technical report, Politecnico di Torino, available at http://www.telematica.polito. it/casetti/TechRep_SUV_Performance.pdf, Mar. 2010.

[8] X. Bai, D. Xuan, Z. Yun, T.H. Lai, and W.Jia, "Complete Optimal Deployment Patterns for Full-Coverage and k- Connectivity (k 6) Wireless Sensor Networks," *Proc. ACM MobiHoc,* pp.May

[9] R. Mangharam, R. Rajkumar, M.Hamilton, P. Mudalige, and F.Bai, "Bounded-Latency Alerts in Vehicular Networks," Proc. *IEEE Mobile Networking for Vehicular Environments* (MOVE Workshop), pp. 55-60, May 2007.

[10] V. Naik, A.Arora, P.Sinha, and H.Zhang, "Sprinkler: A Reliable and Energy Efficient Data Dissemination Service for Extreme Scale Wireless Networks of Embedded Devices," IEEE Trans. Mobile Computing, vol. 6, no. 7, pp. 777-789, July 2007.

[11] P. Barsocchi, G. Oligeri, and F. Potort`ı, "Frame Error Model in Rural Wi-Fi Networks," *Proc. IEEE Int'l Symp. Modeling and Optimization* (WiOpt), WiNMee/WiTMeMo Workshop, pp. 41-46, Apr. 2007.

[12] F.H.P. Fitzek, B. Can, R. Prasad, and M. Katz, "Traffic Analysis And Video Quality Evaluation of Multiple Description Coded Video Services for Fourth Generation Wireless IP Networks," *Wireless Personal Comm.*, vol. 35, nos. 1/2, pp. 187-200, 2005.