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CHARACTERIZE AN APPROACH TO IMPROVE PERFORMANCE OF MULTIMEDIA SERVICES OVER VEHICULAR AD-HOC NETWORK

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Abstract- Multimedia services on wireless devices are most favorable option for next generation users. Standards, concept and tools are being developed for multimedia services for different type of wireless networks. Multimedia services and VANET is a new era of research and development. Now a day's people are spending their time with their automobiles. Everyone wants to get always updated with the news, traffic scenarios and entertainment. Recently, VANET have attracted scientific interest from the research wireless networking community. In this research, primary objective is to enhance performance of multimedia-based services in Vehicular Ad-hoc Network. This research work focuses on analysis of already proposed multimedia services in different wireless ad-hoc network and find out their limitation and possible performance enhancement. In this research we define an approach to enhance peer to peer look-up efficiency and reduce peer to peer management traffic overhead. In real time scenario, our proposed approach improves the quality of communication.
Keywords- Vehicular Ad-hoc Network, Multimedia services, P2P Communication, Artificial Neural Network.

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Introduction

Recent years, wireless communication industry has experienced great development. Various wireless networks have emerged and constituted a complex radio access network environment. In cognitive environment, network resources are always varying with time and space, which is usually called resources mobility. There are two main reasons leading resources mobility: first, resources themselves vary with time; second, user's movement causes resources mobility. Ad hoc networks, which do not rely on any infrastructure such as access points or base station, can be deployed rapidly and inexpensively even in situations with geographical or time constraints. Ad-hoc networks have attractive applications in both military and disaster situations and also in commercial uses like sensor networks or conferencing. In ad hoc networks, each node acts both as a router and as a host. Wireless ad-hoc networking can be employed to facilitate inter-vehicle communication based application. Inter-vehicle communication can be used to develop applications aiming at improved driving safety and convenience. Some of these applications are driver assistance and navigation, dynamic traffic routing, entertainment and cooperative driving. Multimedia devices supporting communication and entertainment are already being deployed in vehicles. However, hostile driving environments and high mobility conditions pose a challenge to the use of wireless LAN infrastructure and routing mechanisms.

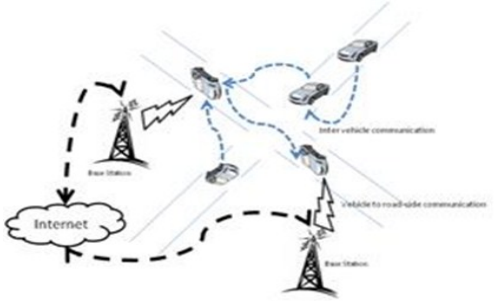

Fig. 1- Vehicular Ad-hoc Network

The remainder of this paper is organized as follows, in Section II,

we summarize VANET and MANET analysis. Then, we discuss on communication in VANET in Section III. Section IV presents the evaluation of VANET standards. Section V provides detailed research on multimedia services and Section VI gives the conclusion.

An analysis: VANET vs. MANET

A Vehicular Ad-Hoc Network is a technology that uses moving cars as nodes in a network to create a mobile network. VANET turns every participating car into a wireless router or node and 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. In the year 2006 the term MANet mostly describes an academic area of research, and the term VANet perhaps it's most promising area of application.

Cooperative Communications in VANET

Ad-hoc wireless networks are formed by users or devices wishing to communicate, without necessity for the help or existence of any infrastructure or centralized administration. Each node has a wireless access interface and is free to enter or leave the network at any time. Ad hoc wireless network can function as stand-alone networks meeting direct communication needs of their users, or as an addition to infrastructure based networks.

Basically, there are two types of systems for wireless networks. One is base-station (BS) oriented and the other is the ad hoc wireless network. In BS-oriented wireless networks, the mobile hosts communicate with base stations, while in the ad hoc wireless networks, the mobile hosts communicate with one another directly. The BS-oriented wireless network has better performance and is more reliable. However, the ad hoc wireless network topology is more desirable because of its low cost, plug-and-play convenience, and flexibility. Its usage of bandwidth and battery power is more efficient. The disadvantage is that the route and communication connectivity is fairly weak. Any migration by mobile hosts participating in one or more routes could make the route invalid. It incurs a lot of cost in keeping communication among them. Thus, the ad hoc wireless network is only suitable for applications in a small geographical area.

VANET offers countless benefits to organizations of any size. Automobile high speed Internet access would transform the vehicle's on -board computer from a nifty gadget to an essential productivity tool, making virtually any web technology available in the car. While such a network does pose certain safety concerns (for example, one cannot safely type an email while driving), this does not limit VANET's potential as a productivity tool. Vehicular Ad-hoc Networks are expected to implement variety of wireless technologies such as Dedicated Short Range Communications (DSRC) which is a type of WiFi. Other candidate wireless technologies are Cellular, Satellite, and WiMAX. Vehicular Ad-hoc Networks can be viewed as component of the Intelligent Transportation Systems (ITS). Vehicles communicate with each other via Inter-Vehicle Communication (IVC) as well as with roadside base stations via Roadside-to-Vehicle Communication (RVC). The optimal goal is that vehicular networks will contribute to safer and more efficient roads in the future by providing timely information to drivers and concerned authorities.

Evaluation of Vanet's Standard

A lot of work has been carried out in VANET by researchers. This part of study enlightens briefly on some of work done by those researchers. The work from various books, papers, articles, journals has been referred for this purpose. It is humble approach to thank those researchers whose work done will be referred in this research. Some of them are mentioned in this article. Rest are enlisted in the reference section of this document.

In the past few years, we have seen the emergence of technologies providing network connectivity to mobile users. These technologies are based on a backbone of access points, which mobile devices can connect to. Examples of such systems are the cellular network or WiFi networks. Yet, a growing demand on increased bandwidth and improved communication quality made engineers choose to decrease the transmission range of mobile remote devices. Consequently, the backbone had to be re-designed with an increased number of access-points [1]. Therefore, the infrastructure -based approach is not always most effective and is naturally implemented by direct communication between terminals, also called ad-hoc communication. One emerging new type of ad hoc networks is vehicular ad hoc networks (VANETs), in which vehicles constitute the mobile nodes of the network. Enhancements in transportation technologies have to consider, besides traditional aspects such as security and driving conditions, the ability of vehicles to communicate. It also covers the internetworking of vehicles to the Internet. Connecting vehicles to the Internet provides users with the possibility to have an access to web services.

Mobile nodes in an ad hoc network have limited radio transmission range. Nodes that are unable to communicate directly with each other require intermediate nodes to forward packets for them. Each node acts both as a router and as a host. The function of a routing protocol in ad hoc network is to establish routes between different nodes[2]. Much research work has been done on routing in ad hoc network. There have been many techniques or concepts proposed for supporting a WLAN with and without infrastructure, such as IEEE802.11, HIPERLAN, and ad hoc WATM LAN. The standardization activities in IEEE802.11 and HIPERLAN have recognized the usefulness of the ad hoc networking mode. IEEE 802.11 enhances the ad hoc function to the MH. HIPERLAN combines the functions of two infrastructures into the MH[3].

At this time, the demand for (and need for) increased data bandwidth continues relentlessly. However, present day approaches to technology are trying to keep up with this progress [5]. Future vehicular networks may require mobile devices to cross over different servicing locations. Maintaining network services requires seamless integration of different networks. An in-vehicle user roaming between different wireless communications technologies requires efficient handover between different networks and continuous connections of applications in the different networks. However, advanced multimedia services require increasing network bandwidth and improved quality. To satisfy the high quality requirements of heterogeneous vehicular network users, an effective QoS mechanism is needed. The rapid deployment of the wireless networks now enables Mobile Node to provide continuous internet access when it is moving. An MN located in an access network with weak strength must optimize network quality by performing handover conversion. MN can access different networks in a next-generation network architecture that includes 3G and WiMAX access technologies [6].

Multimedia Services Over Vanet

Multimedia-based services and wireless network are very close to each other. There are various standards developed for multimedia-based services for wireless network, wireless ad-hoc network, wireless multi-hop network and mobile ad-hoc network. These standards are always getting improved by the researcher community. Multimedia-based services over VANET are a new promising area. As we know that we spent our lot of time with our automobiles. We always want to get updated with the current knowledge about news, traffic scenarios and entertainment. Here, VANET plays very important roles in providing services within reach of user while moving in their automobiles.

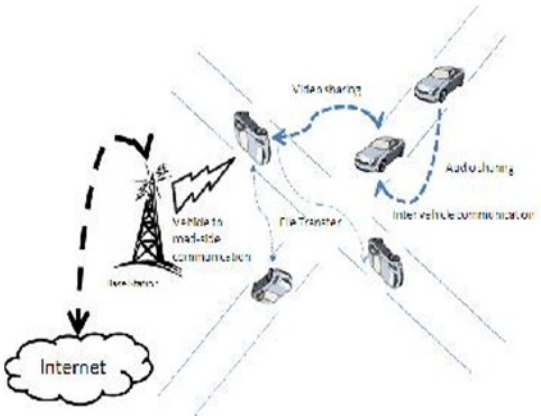

Fig. 2- multimedia services & VANET

Vehicular Ad-Hoc Networks are wireless networks between vehicles. Recently, they have attracted increasing scientific interest from the wireless networking community. Our primary objective is to provide user friendly multimedia-based services in the field of Vehicular Ad-hoc Network, through the help of which we would be able to serve the society in the field of Vehicular Ad-hoc Network. Overall approach of our research work mainly focuses on analysis of already proposed multimedia services in different wireless ad-hoc network. Peer to peer communication is very crucial for any ad-hoc network. In vehicular ad-hoc networking, all mobile nodes communicate with each other through peer to peer communication. Our approach includes study of limitation of peer to peer communication. A high performance algorithm based on an artificial neural network structure (ANN) improves the peer to peer communication quality metrics that is severely degraded as the traffic and number of multiple hops increase. The algorithm is intended to find solutions which ensure network connectivity and keep the coverage above a certain level, while extending its lifetime. Our proposed algorithm improves the scalability of multimedia services in Vehicular Ad-Hoc Networks. In this research we define an approach to enhance peer to peer look-up efficiency and reduce peer to peer management traffic overhead. Applying our proposed approach in real time environments through vehicular ad-hoc network simulators improves the quality of communication.

Although, various standard, tools and technologies are available in Vehicular Ad-Hoc Networks for effective communication among various mobile nodes. There is lot of scope available in the promising area of Vehicular Ad-hoc network. The scientific research method, which led to this research, includes the literature review use to get an overview of the field and to compose the problem statement and hypothesis formulation. Finally, the experiments and results are done with conclusions.

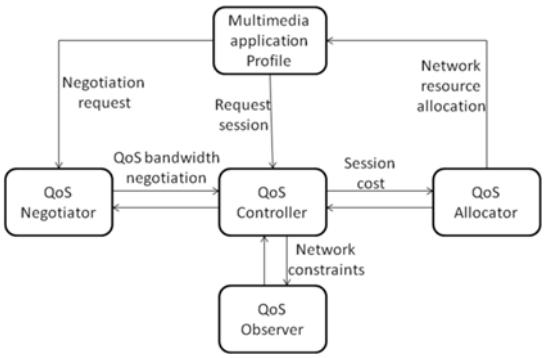

Fig. 3- QoS system for multimedia services

In experimental method, problems are modelled by simulation, emulation, and real measurement. Experimental methods are often used when the model is too complex to allow analytical methods. In the same manner as analytical method, a simulation uses an abstract representation of the system. The abstraction is created by a computer program called the simulation tool. Compared to analytical method, it is easier to incorporate more details in the simulation, and, thus, simulations often produce more realistic results. Despite the advantages of simulation, simulators may require high computational complexity which leads to longer simulation time. During emulation, measurements are performed on a real implementation of a system running on real hardware. For this research we mainly use simulation as research method. Feedback and acknowledgement mechanism is used to gather information about the current network conditions. Our approach defines Controller module, Observer module, Negotiation module and Allocation module. The Control module receives the application requirement from the vehicular terminal. It then ensures the network to see whether there is sufficient bandwidth available to fulfill the requirements of the application. If the network has reserve the bandwidth to the application, the Controller sends the information to the terminals. The Observer module is used to check the condition of network for the multimedia application through a database file to store the application requirement information. The process of comparison between the application requirement and the network constraints is carried out from time to time. When the network cannot satisfy the application requirement the Observer calls Allocation module to adjust the bandwidth allocation for application in the vehicular network. Once the bandwidth allocation process has been accomplished but the existing bandwidth still cannot satisfy the application requirement, the QoS Negotiation is used to negotiate according to the requirements of the multimedia application.

Conclusion

Future vehicular networks may require mobile devices to cross over different servicing locations. Maintaining network services requires seamless integration of different networks. An in-vehicle user roaming between different wireless communications technologies requires efficient handover between different networks and continuous connections of applications in the different networks. However, advanced multimedia services require increasing net-

work bandwidth and improved quality. To satisfy the high quality requirements of heterogeneous vehicular network users, an effective QoS mechanism is needed. Multi-hop wireless ad hoc network is a special kind of ad hoc network which overcomes this limitation by exploiting communication between nodes that are not within the each other's communication range. Multi-hop wireless ad hoc networking brings new opportunities for low-cost extension of today's popular Internet technology, vehicular communication and specialized scenarios mentioned earlier. While still years away, VANET is a technology that could significantly increase productivity during times that are usually unproductive.

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