VIDEO TRANSMISSION OVER BEST AVAILABLE RADIO INTERFACE BY USING RANDOM ACCESS TECHNOLOGY IN COGNETIVE VANET

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Abstract: The objective of this paper is to increase the data delivering quality by minimizing the packet loss rate in VANET. In VANET quality of communication is quantified by measuring packet delivery ratio. In video streaming application, streamed data is encoded into packets and it is transmitted though interface IEEE802.11p/DSRC based ad hoc connection. In direct short range communication (DSRC) Packet delivery ratio (PDR) decreases as distance between Tx & Rx pair increases. At that time the packet sent over LTE interface have high success rate in free space scenario. LTE overcomes the line of sight (LOS) caused by obstacles. Here Vehicles are equipped with dual interface to enable communication.DSRC & LTE combined with radio access technology (RAT) selection algorithm enhances the delivery of transmitted packets.

Index Terms **- high transmission rate, resource allocation, video streaming, cognitive vehicular network, radio access technology, dual interface.**.

I. INTRODUCTION

Recently, several studies [1–3] urged to combine different radio access technologies into a unified Hybrid Vehicular Networking (HVN) architecture. The potential of having several radio access technologies for vehicular communications not only enhance existing applications but also spur an array of new services. However, successful implementation of such hybrid architecture is often attributed to efficient management of combined radio resources. Central to this are the Radio Access Technology (RAT) selection algorithms which determine what access technology to select while preserving the connectivity through Vertical Hand over (VHO). It is highly desirable to limit the number of unnecessary VHOs because of higher VHO signaling cost and the delay incurred due to VHOs often translated as data throughput lost. To fully exploit the potential of HVN architecture we consider to combine IEEE 802.11p [4] based ad hoc network and infrastructure-based LTE [5] cellular networks. It is envisioned that the proposed HVN architecture would support different types of uses cases and applications such as road safety, traffic efficiency and infotainment. These applications exchange messages called beacons at regular interval and the frequency with which beacons are transmitted is termed as beaconing frequency. Since each application has its own set of functional and performance requirements, typically the beaconing frequency varies between 1Hz to 10 Hz. The IEEE 802.11p standard provides ad hoc networking capabilities to exchange messages directly and is particularly suitable for low to medium range and delay sensitive vehicular networking applications.

On the other hand LTE by 3GPP promises to offer medium to large communication range, higher data rates with moderate delays. Each beacon is sent to the base station (eNodeB), which traverse through the core network before reaching an Intelligent Transportation Systems (ITS) Server. In the last years, mobile networks have invaded daily lifestyles providing extended information exchange. The application of such mobile communications in transportation leads to the emerging technology: vehicular ad hoc networks (VAN ET). Allowing vehicle to vehicle and vehicle to roadside wireless communications, VANET is an autonomous and self organizing form of MANETs [1].Exchanging information among vehicular nodes is one of the most up-to-date topics for both academic research and industrial investigations [23]. This technology enables a variety of applications that impact the human daily life such as infotainment, traffic management services and safety applications. Actually, travelling experience is no longer a tradition transportation service. Drivers need to maintain social connection during their trip with messages and multimedia contents exchange make emerging mobile social network(MSN) [3] likely services to be projected on vehicular networks. Moreover, Intelligent Transportation Systems (ITS) aim at encountering traffic congestion especially in big cities [4]. VANET as a form of ITS has to include cooperative driver assistance with essential information such as traffic jams, road maps.

One of the major VANET applications is safety-related information providing. It would avoid collisions or warn passengers about hazardous situation after determining which vehicles are near to an accident site to reduce vehicles pile up or fix responsibility. It also alert driver about road breaking or high speed [5]. This latter category of applications is the most Important for saving human lives by avoiding road accidents and decreasing number of deaths. Once a hazardous road condition or an imminent dangerous incident occurs, an event driven safety message has to be generated and disseminated in order to warn drivers and passengers about the situation to appropriately react so as to avoid the danger. Forward and backward communications between vehicles and also communication between road infrastructure and vehicles are needed; therefore this type of applications requires broadcasting and rebroadcasting of data messages from the source, warning generator, to all nodes in the net- work.

However, the broadcasting mechanism has to deal with vehicular ad hoc network VANET specific features [1] such as rapidly changing topology, vehicle high mobility, heterogeneous and unbounded environments, time critical, limited transmission radius of a vehicle constrained by the deployed technologies and others many vehicular ad hoc network (VANET)characteristics which make broadcasting in vehicular ad hoc network (VANET) more challenging in terms of performances and QoS than in the rest of MANETs. In literature many elaborated research works in the aim of improving broad- casting over vehicular ad hoc network (VANET). Thereby, we find several reviews studying and discussing existing broadcasting schemes and presented algorithms [7]. Nevertheless, there are too few surveys assembling works on broadcasting in vehicular ad hoc network (VANET) and studying them from a QoS perspective. In this paper we give a detailed review of vehicular ad hoc network (VANET) main features and issues. We try to define QoS in a broadcasting context and according to different VANET services. The rest of the paper is organized as follows. First part we introduce related surveys. Second part summarizes vehicular ad hoc network (VANET) main applications and describes vehicular ad hoc network (VANET) architecture and characteristics. In third part we discuss broadcasting issues, unsolved problems in vehicular networks and the result is obtained by solving the problems.

Symbol	**Description**
CR	Cognitive Radio
DSRC	direct short range communication
FH	frequency hopping
MSN	mobile social network
ITS	Intelligent Transportation Systems
QOS	quality of service
PSNR	peak signal-to-noise ratio
V2V	vehicle-to-vehicle
V2I	vehicle-to-infrastructure
HVN	Hybrid Vehicular Networking
CRERSU	cognitive radio-enabled roadside units
RAT	Radio Access Technology
VHO	Vertical Hand-over
VANET	vehicular ad hoc network
eMBMS	Evolved Multimedia Broadcast Multicast Service
ABC	Always Best Connectivity
CUS	cognitive users
MANET	Mobile ad hoc network
LOS	line-of-sight
PLR	packet loss rate

II. SYSTEM MODEL

QOS-AWARE VIDEO TRANSMISSION PROTOCOL OVERHYBRID VEHICULAR NETWORK

The protocol design follows ”Always Best Connectivity” concept which states that always connected in all best possible and transparent way for seamless connectivity in multiple network environment. The large deployment of different radio access networks and their coverage extension give connectivity alternatives to end-users [23]. While there can be several competent communication technologies such as IEEE 802.11p/DSRC, WLAN, 4G/LTE, we leverage, in this study, IEEE 802.11p/DSRC and 4G/LTE technologies as two potential candidates for data transmission in the hybrid vehicular network. From figure.1 In Hybrid Vehicular Network (HVN), vehicles are part of aV2X network with an option of sending data either by using ad hoc communication link as defined by IEEE 802.11p/DSRC standard or by using a cellular network infrastructure such as 4G/LTE. It involves Vertical Handover (VHO) to provide seamless switching between two radio access technologies (RAT).

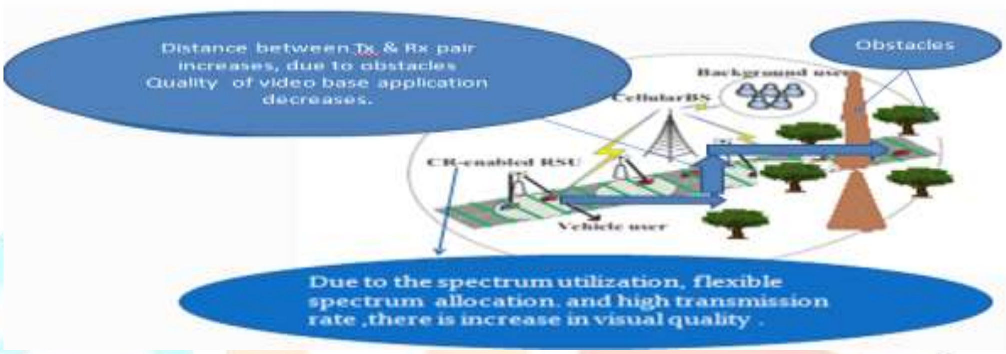

Figure .1.network architecture

The RAT selection and VHO decisions are made in dual-interface enabled communication unit in every vehicle based on a number of factors such as application QoS requirements, network resources availability and cost, etc.As Fig. 1 illustrates, within an HVN, the network components communicate in several different ways. The figure shows the information flow among various components. All vehicles send application data either periodically or event based triggered. Two options are available for communication, either in ad hoc or direct short range links fashion or through the infrastructure-assisted cellular network. In the former case, single-hop broadcasting is performed to send warnings and cooperative awareness messages to nearby vehicles based on IEEE 802.11p/DSRC standard. The delay sensitivity of the messages doesn’t allow extra time delay for association or authentication processes. Alternatively, communication over 4G/LTE can be applied to distribute information messages among a large number of users within an extended area. For some applications that require a centralized aggregation point before disseminating data, the infrastructure support is in the form of back-end server within or outside the LTE network which plays a key role of message rendezvous. First, vehicles initiate uplink transport of application data to the back-end server. The application server applies application-specific processing such as filtering or aggregation and forwards the data towards the vehicle within the destination region.

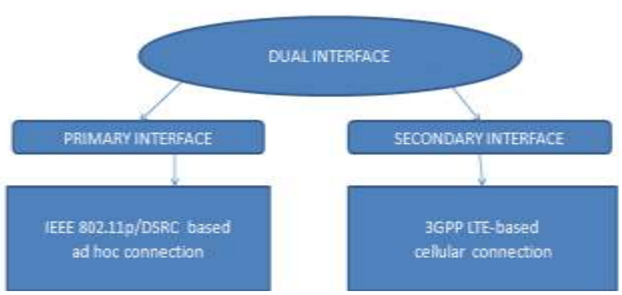

Figure.2.dual interface

The downlink transport of data messages can be performed in one of the several ways. The simplest approach, but less resource efficient, is to send multiple unicast messages to each vehicle located within the destination region. Alternatively, Evolved Multimedia Broadcast Multicast Service (eMBMS) can also be utilized, however at the expense of maintaining multicast groups. Equally possible is to send a unicast message to any of the vehicles in the destination region, which in turn broadcasts to the neighboring vehicles.

Radio Access Technology (RAT) Selection and Vertical Handover (VHO)

This sub-section explains a joint QoS-aware RAT selection and vertical handover algorithm. It is assumed that vehicles are equipped with dual-interface enabled communication unit where primary interface is IEEE 802.11p/DSRC-based to provide ad hoc connectivity, and the secondary interface is3GPP LTE-based cellular connectivity[23]. During the initialization phase, vehicular applications like video and traffic safety specify their QoS requirements in term of common performance metrics such as latency, bandwidth, packet loss rate (PLR) and communication cost. In the proposed RAT selection technique, the focus is on the minimum packet loss that has not been the focus earlier.

The main idea is to constantly monitor and maintain the minimum packet loss termed as PLR_Threshold that is critical to achieving certain QoS requirement of each application, and that shall be satisfied by the in-vehicle communication unit between the source and intended destinations. Next, important communication parameters are set such as data transmission rate i.e. the number of packets per second and the time window length over which the radio interface is monitored and assessed. Initially IEEE 802.11p/DSRC based primary interface is selected as the default access network to send application data over the direct communication link. Each vehicle continuously assesses the Packet Loss Rate (PLR) over the primary interface. Here, PLR is defined as the ratio between a number of received packets and the actual number of sent packets.

The monitoring and assessment of the IEEE 802.11p link keeps on going through a background process which continuously measures the link reliability based on high frequency exchanged packets such as Cooperative Awareness Messages (CAM) [17] for ETSI or Basic Safety Messages (BSM) in DSRC [2] message set dictionary. The resulting metric is named *PLR_DSRC*.

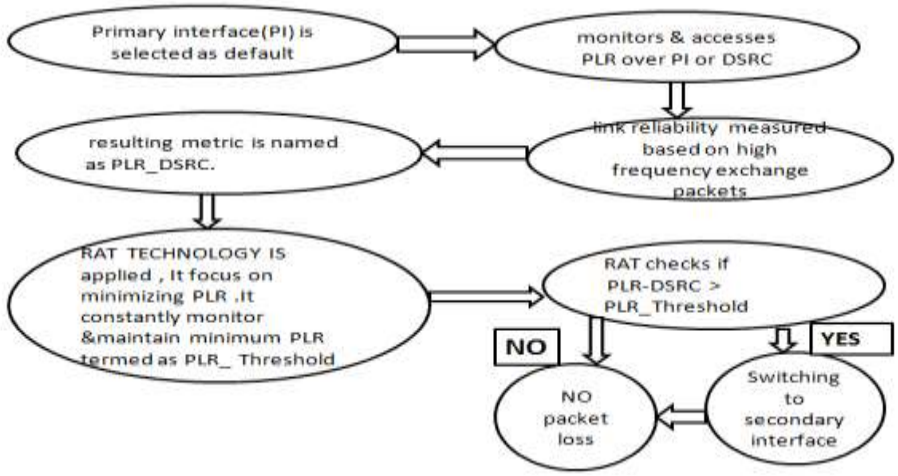

Figure.3. RAT selection procedure

From figure.3. RAT selection procedure checks if the PLR_DSRC exceeds a predefined QoS threshold value, i.e., PLR_Threshold,as determined by the application requirements. If the PLR_DSRC exceeds the QoS threshold PLR_Threshold, the switching to the LTE access technology (Secondary interface) is performed. On successful RAT selection, vertical handover is performed and data packets are sent over the selected network technology. To avoid frequent switching (or the ping-pong effect [8]) between the two networking technologies, the PLR_DSRC has to be consistently below the given threshold value PLR_Threshod. If this latter goes down for a predefined number of times (default value equal to three assessment times ($n = 3$)), the primary interface is selected. Network conditions are periodically checked and the procedure above is being executed accordingly.

The vertical handover process is initiated whenever the packet loss rate of the running applications is higher enough than the QoS threshold such that the primary interface is unable to support. The control returns to the primary interface once it is found deem suitable for meeting the application's QoS requirements. Fig. 2 shows the side-by-side flowcharts of the application and Radio Access Technology (RAT) selection execution flows in the event of a VHO, respectively.

Steps:

1) By default Primary interface (i.e., IEEE 802.11p) is selected.
2) When an application is scheduled to send information, it opens a socket and transmits the information in packets.
3) In case the packet transmission is unsuccessful, or a problem is detected either during the transmission or reception of the packets, generally due to link quality degradation, the application is notified so that it either retransmits the lost packets or ignores the losses and sends the next packet.
4) The Secondary interface (i.e., 3GPP LTE) is selected according to the given network selection policy.

5) Whenever the PLR_DSRC is above the applications PLR_Threshold (i.e.,PLR_DSRC >=PLR_Threshold) the vertical handover (VHO) is initiated.
6) The connection is transferred to the secondary interface and made active.
7) On successfully completing the handover process, a timer is set that specify the time interval (i.e., n ∗Tw) secondary interface must be used before switching back to the primary interface. As soon as the timer expires and the PLR_DSRC is checked to be lower than the PLR_Threshold, the execution flow goes back and starts monitoring the PLR over the primary interface.

This proposed work presents a hybrid communication scheme in vehicular networks. The architecture is based on dual-interface enabled V2X communication where IEEE 802.11p/DSRC radio technology and 4G/LTE-based cellular connectivity are provided to ensure reliable data exchange and a quality of service for the video streaming application. We followed Always Best Connectivity (ABC) approach by offloading data transmission to the 4G/LTE radio interface whenever the link quality of IEEE 802.11p/DSRC interface is degraded.

Extensive measurement-based studies were carried out using a test bed setup along with the software protocol stack. The field results were gathered under various networking conditions and in the presence of different types of obstructing objects (LOS, NLOS_V, and NLOS_B). The test bed measured the performance gained by using an adaptive interface switching regarding packet-level. The results show the feasibility of the proposed approach and significant improvements regarding communication reliability. The reliable communication range could also be extended as well. The seamless network switching, achieved through the QoS-aware RAT selection and VHO algorithm, allows the vehicles0 passengers to watch a smooth video streaming without crashes or interruptions. The proposed approach reports an efficient trade-off between the usage of the IEEE 802.11p/DSRC interface on the one hand, and ensuring a better quality of service of the video streaming on the other hand. In future work, we will look into developing a link quality estimator that could predict the link reliability in the near future based on the vehicle0s kinematics and the evolving networking conditions. Such an estimator could avoid the loss of some packets before switching to 4G/LTE interface or an earlier switch back to IEEE 802.11p/DSRC interface when the link quality estimation is assessed favorably.

- Node size =20
- Node power=0.1mw
- Node dead=0
- Cluster radius=25m

Sort node by distance:
If node xy(i,k)<node xy(J,k)=
Swap no (nodexy(i,k),node xy(J,k))
[i=1: node size, n=i+1: node size]

III. RESULTS AND DISCUSSION

Simulation results in figure1 shows the vehicles location. There are 20 vehicles .This all vehicles are active. These are all considered as nodes. All nodes are active. No dead nodes.

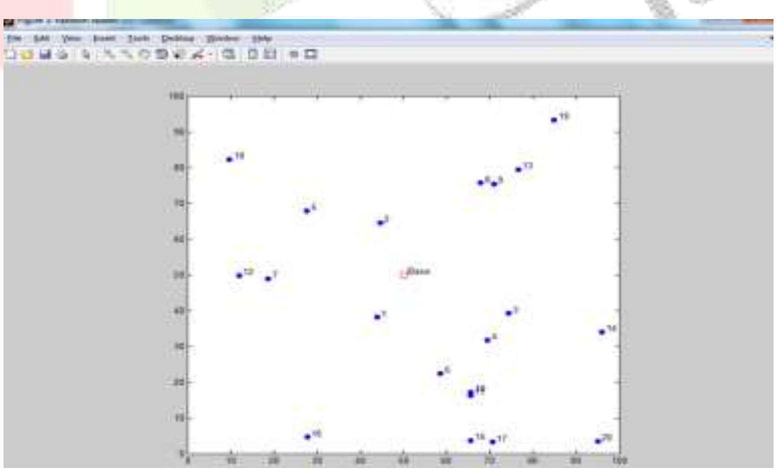

Fig.1.vehicluar network users.

When the vehicular network users are travelling in forest or hilly areas due to the obstacles ,line of sight may happen so there will be fading ,packet loss and packet delivery quality also decreased .so here dual interference is used. In this automatic switching from one interface to other happens based on the distance.

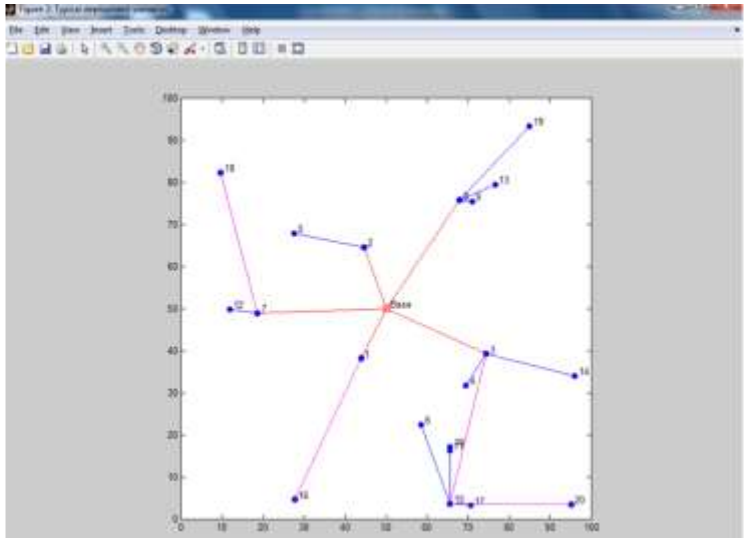

Fig .2 switching from one interface to another base on distance

For example from figure 2 if a vehicular network users in node 7 and node 12 wants to transmit and receive video date first the distance is calculate, if it is minimum distance video data is transmitted by IEEE interface, In other case if node 7 wants to communicate with node 18It is a long distance communication so switching to LTE interface will happens. In LTE there will be minimum fading, packet loss is minimum and packet delivering quality is high.

REFERENCES

[1] J. R. Jiang, Y. C. Tseng, C. S. Hsu, and T. H. Lai, “Quorum-based asynchronous power-saving protocols for IEEE 802. 11 ad hoc networks,” in Proceedings of the IEEE International Conference on Parallel Processing (ICPP '03), October 2003.

[2] R. Zheng, J. C. Hou, and L. Sha, “Asynchronous wakeup for ad hoc networks,”in Proceedings of the 4th ACM International Symposium on Mobile Ad Hoc Networking and Computing (MOBIHOC '03), pp. 35–45, June 2003.

[3] J. R. Jiang, Y. C. Tseng, C. S. Hsu, and T. H. Lai, “Quorum-based asynchronous power- saving protocols for IEEE 802.11 ad hoc networks,” Mobile Networks and Applications, vol. 10, no. 1, pp. 169–181, 2005

[4] F. Akyildiz, W. Y. Lee, M. C. Vuran, and S. Mohanty, “NeXt generation/dynamic spectrum access/cognitive radio wireless networks: a survey,” Computer Networks, vol. 50, no. 13, pp. 2127– 2159, 2006Z.

[5] T. Chou, Y. H. Lin, and R. H. Jan, “Optimal fully adaptive power management protocols for asynchronous multi-hop ad hoc wireless networks,” in Proceedings of the 11th IEEE Singapore International Conference on Communication Systems (ICCS '08), pp. 569–573, November 2008

[6] H. Su and X. Zhang, “Channel-hopping based single transceiver MAC for cognitive radio networks,” in Proceedings of the 42nd Annual Conference on Information Sciences and Systems (CISS '08), pp. 197–202, March 2008

[7] M. D. Silvius, F. Ge, A. Young, A. B. MacKenzie, and C. W. Bostian, “Smart radio: spectrum access for first responders,” in Wireless Sensing nand Processing III, vol. 6980 of Proceedings of the SPIE, 2008.

[8] L. A. DaSilva and I. Guerreiro, “Sequence-based rendezvous for dynamic spectrum access,” in Proceedings of the 3rd IEEE Symposium on New Frontiers in Dynamic Spectrum Access Networks (DySPAN '08), pp. 440–446, October 2008

[9] Y. R. Kondareddy, P. Agrawal, and K. Sivalingam, “Cognitive radio network setup without a common control channel,” in Proceedings of the IEEE Military Communications Conference (MILCOM '08), November 2008.

[10] K. Bian, J. M. Park, and R. Chen, “A quorum-based framework for establishing control channels in dynamic spectrum access networks,” in Proceedings of the 15th Annual ACM International Conference on Mobile Computing and Networking (MobiCom '09), pp. 25–36, September 2009.

[11] L. Jiao and F. Y. Li, “A single radio based channel data rate-aware parallel rendezvous MAC protocol for cognitive radio networks,” in Proceedings of the IEEE 34th Conference on Local Computer Networks (LCN '09), pp. 392–399, October 2009.

[12] S. Geirhofer, J. Z. Sun, L. Tong, and B. M. Sadler, “Cognitive frequency hopping based on interference prediction: theory and experimental results,” ACM SIGMOBILE Mobile Computing and Communications, vol. 13, pp. 49–61, 2009.

[13] C. M. Chao, H. C. Tsai, and K. J. Huang, “A new channel hopping MAC protocol for mobile ad hoc networks,” in Proceedings of the International Conference on Wireless Communications and Signal Processing (WCSP '09), November 2009.

[14] E. K. Lee, S. Y. Oh, and M. Gerla, “Randomized channel hopping scheme for anti-jamming communication,” in Proceedings of the IFIP Wireless Days (WD '10), October 2010.

[15] C. Cormio and K. R. Chowdhury, “Common control channel design for cognitive radio wireless ad hoc networks using adaptive frequency hopping,” Elsevier Ad Hoc Networks, vol. 8, no. 4,pp. 430–438, 2010.

[16] C. Cormio and K. R. Chowdhury, “An adaptive multiple rendezvous control channel for cognitive radio wireless ad hoc networks,” in Proceedings of the 8th IEEE International Conference on Pervasive Computing and Communications Workshops (PERCOM WS '10), pp. 346–351, April 2010.

[17] N. C. Theis, R. W. Thomas, and L. A. DaSilva, “Rendezvous for cognitive radios,” IEEE Transactions on Mobile Computing, vol. 10, pp. 216–227, 2010

[18] H. Liu, Z. Lin, X. Chu, and Y. W. Leung, “Ring-walk based channelhopping algorithms with guaranteed rendezvous for cognitive radio networks,” in Proceedings of the International Workshop on Wireless Sensor, Actuator and Robot Networks (WiSARN-FALL '10), in conjunction with IEEE/ACM CPSCom, China, December 2010.

[19] C. M. Chao and Y. Z. Wang, “A multiple rendezvous multichannel MAC protocol for underwater sensor networks,” in Proceedings of the IEEE Wireless Communications and Networking Conference (WCNC '10), April 2010.

[20] M. Altamimi, K. Naik, and X. Shen, “Parallel link rendezvous in ad hoc cognitive radio networks,” in Proceedings of the 53rd IEEE Global Communications Conference (GLOBECOM '10), December 2010. F. Hou, L. X. Cai, X. Shen, and J. Huang, “Asynchronous multichannel MAC design with difference-set-based hopping sequences,” IEEE Transactions on Vehicular Technology, vol. 60, no. 4, pp. 1728–1739, 2011.

[21] S. Romasz ko and P. Mähönen, “Grid-based channel mapping in cognitive radio ad hoc networks,” in Proceedings of the 22nd Annual IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC '11), September 2011

[22] Hongli He, Hang guan Shan, Member, IEEE, Aiping Huang, Senior Member, “Resource Allocation for Video Streaming in Heterogeneous Cognitive Vehicular Networks” IEEE, and Long SunDOI .2016.

[23] Mohamed Ben Brahimab, Zeeshan Hameed Mirc, Wassim Znaidia, “QoS-Aware Video Transmission over Hybrid Wireless Network for Connected Vehicles”, IEEE access.2682278.2017.