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Control System Using Load Balancing Mechanism In VANET

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Abstract- The traffic control systems in vehicles are normally scheduled based on the pre timed slot manner. This approach is likely to be failed on minimizing the waiting time of vehicles. In order to overcome this problem, a traditional load balancing technique and an adaptive and intelligent traffic control system is proposed in such a way that a traffic signal controller with wireless radio installed at the intersection and it is considered as an infrastructure. In this method all the nodes (Vehicles) are tracked based on their location and moment of the nodes via wireless sensors. The sensors are activated once the nodes crossed the boundary between Wifi Signal. Then the controller runs Oldest Job First algorithm which treats platoons as jobs. The algorithm schedules jobs in conflict free manner and ensures all the jobs utilize equal processing time i.e the vehicles of each platoons cross the intersection at equal delays. This paper proposes a new implementation on VANET based on new channel reservation scheme which internally uses the queuing theory to initiate the process and to control the load balancing.

Keywords: Channel reservation, Handoff, Call dropping, QoS

I.INTRODUCTION

With increasing demands for VANET multimedia services such as video, audio, and data, next-generation wireless networks are expected to provide quality of service (QoS) for such multimedia applications to users on the move. Since the multimedia services have inherently different traffic characteristics, the QoS requirements always differs for bandwidth, delay, and connection dropping probabilities. It is the responsibility of the network to fairly and efficiently allocate network resources among different users to satisfy such differentiated QoS requirements for each type of service. In recent years, due to increase in VANET velocity and scarce radio spectra, allocation of suitable bandwidth is difficult for VANET devices before handoff to the appropriate cell. VANET devices may come through performance degradations because of the handoff frequencies that are affected by progressive increase in cell size. As the user mobility is variable, prediction of appropriate cell for handoff become complex.

The rapid advance in wireless and VANET communications field provides many new and improved services to their customers. While the analog services has been supported by first generation VANET service, the next generation (i.e) second generation is meant for providing digital voice which is a kind of digital service and low rate circuit switched data services. The third-generation (3G) systems were aimed at providing multimedia VANET services and achieving a maximum bit rate of 2 Mb/s . The migration of 3G networks has already begun and researchers are thinking how 3G networks will evolve to fourth-generation (4G) systems where the

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VANET technologies will be integrated to provide the useful services. In the present generation of VANET communications networks (third generation (3G), beyond third generation (B3G), and fourth generation (4G), it is necessary for the network to provide wide range of services such as multimedia application that includes real time applications providing quality of service with required level. The communication services should be provided without any interruption at anytime and anywhere which is a big dream and challenge in the communication industry. It is expected that in the future we will reach the point where the number of worldwide wireless subscribers will be higher than the number of wire line subscribers.

One of the basic limitations of the wireless VANET networks is the scarcity of the available bandwidth. There are two basic characteristics of the wireless VANET networks that are important to manage the available radio resources: mobility of the users and the limited communications bandwidth. Since the users are VANET the communication at different location and also during motion, the communication service is provided by mobility. The user is supposed to have the service at any location covered by the serving network. The totally free mobility is the ultimate goal from the users perspective. From the service provider perspective, the mobility of the users can cause a significant overhead in the management of available bandwidth. Because of the mobility of the users, it is required in the VANET communication environment to reserve the bandwidth for the served users in the neighbor cells to ensure the continuity of the calls without interruption while the user is moving from one location to another.

Two main reasons that affect the available bandwidths are the increasing number of VANET users and the high bandwidth required by the new multimedia services (video, images, audio, data ... etc.). The main duty of VANET network is to have better control of admission of the new calls (this is known as the call admission control problem), and also to reserve bandwidth in neighboring cell to maintain the existing call without dropping (this is known as the resource reservation problem) and to provide the service without interruption for a large number of customers. This makes the problem of call admission control (CAC) and Resource Reservation (RR). In this Paper, we are introducing a new solution to solve the problem of CAC and RR.

Handoff:

Handoff is the process of transferring ongoing call from one cell to another cell as the user moves through the coverage of the cellular system. Handoff occurs when the signal strength of call reduces below the threshold level. Handoff is initiated by base station.

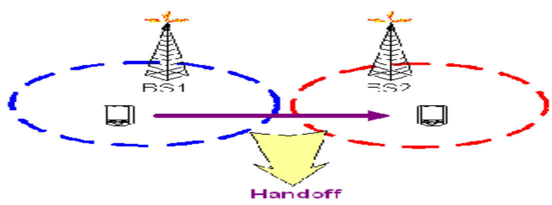

FIG 1:HANDOFF

II. RELATED WORK

Resource management is very crucial problem in wireless network due to the scarcity of resource availability. So this problem must be handled carefully[7]. There are many works have been carried out to tackle this problem. Three techniques used to solve this problem for FDMA based networks[3]. They are Fixed Channel Allocation(FCA), Dynamic Channel Allocation(DCA), Hybrid

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Channel Allocation(HCA). In FCA the available frequency band is divided into fixed size and allocated to cells for use. In DCA the resource is utilized based on the application. HCA is combination of FCA and DCA. There are several techniques used to handle handoff problem

Usually the handoff problem can be overcome by allocating priority to the handoff calls. So the handoff call which has higher priority must be given importance.[9] Usually higher priority will not be awarded for the data calls when ongoing voice call is present. Handoff calls are given more priority than new calls. This issue can be overcome by priority allocation.

Another technique is guard channel concept[4]. Here the fraction of total available channel is dedicated for handoff calls. Queuing of handoff calls can also be done to solve handoff management problem. Recently techniques have been introduced so as to maintain required QOS by proper reservation and utilization of channel[11]. The very difficult performance is proper maintenance of number of guard channel.

There are some works in which a fixed number of guard channels will be allocated. While in some other cases the guard channels will be allocated dynamically based on the arrival of the handoff calls. Also the channels are allocated for the handoff calls based on mobility prediction. So the mobility of the node determines the allocation of the channel[10]. The new dynamically adaptive channel reservation scheme is a technique in which the channels allocated for handoff calls can also be used to handle the new calls. This algorithm is useful for predicting the location of the VANET terminal.

There are also several channel assignment algorithm namely classic algorithm, macro algorithm. For handoff management we have idle-mode, bonus-based algorithm and idle-bonus algorithms[5]. In order to optimize the handoff between the heterogeneous network a unique technique is used which is known as the Media Independent Handover(MIH).

III. PROPOSED SCHEME

In this paper, for the expected handoff a channel will be allocated in the neighboring cells. In order to reduce call dropping and call blocking careful allocation of resources should be done. Here a queuing system is been used so as to carryout bulk handoff. Also the queuing theory is used for delay estimation. So by using queuing theory effective channel reservation and handoff management can be achieved.

Here the channel reservation is made by VANET Switching Centre. MSC plays important role in handling handoff. So whenever the signal strength of the call reduces it is the duty of MSC to switch over the call from one cell to another cell.

The input to the queue arises as poison variable. The queuing system used here is single server single queue system.

The spectral efficiency of the system is very important factor. So here first effective spectral efficiency is achieved.

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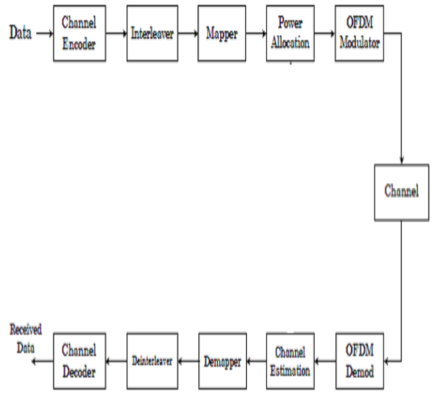

FIG 2: TRANSMISSION OF DATA

So here, first the communication system is been established based on the wimax standard and then the signal is transmitted.

Channel encoder:

First, the signal is given to the channel encoder. Here the redundant bits are added. So here the noise caused during transmission will be recovered at the receiver. Reed-solomon code is used for encoding.

Interleaver:

Then the encoded signal is passed to interleaver. Here the bits are shuffled and then transmitted. Hence, this reduces the bit error rate.

Mapper:

Mapper performs the function of modulation

Power allocation:

The power is allocated for the sub carrier signals

OFDM modulator:

OFDM modulator is used because of high data rate. The sub carrier signals are orthogonally placed there by preventing overlapping of signals. Then each subcarrier signal is modulated.

The signal is transmitted by MIMO technique. The number of sub carrier signals is then fixed. Number of symbols in frames is also allocated. The cyclic prefix is used to prevent interference in the OFDM modulation.

Space time block code is used for transmission. It is a technique in which multiple copies of original stream is transmitted. Due to the obstacles present the signals transmitted undergoes reflection resulting in reduction of strength of the transmitted signal. The receiver picks up the signal copy that is least affected by error.

The input serial data stream is formatted into the word size required for transmission, e.g. 2 bits/word for QPSK, and shifted into a parallel format. The data is then transmitted in parallel by assigning each data word to one carrier in the transmission.

Thus the data is coded, interleaved and modulated. A scheme is used for the transmission of signal which is been modulated and tha scheme is referred to alamouti scheme. At the receiver side the signal is demodulated, demapped, deinterleaved and decoded to get the original signal.

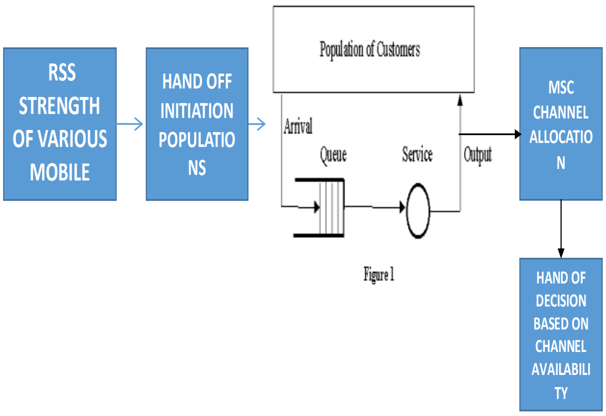

FIG 3:SYSTEM BLOCK DIAGRAM

RECEIVED SIGNAL STRENGTH

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The RSS is the important factor in handoff phenomenon. Because, handoff occurs based on the received signal strength. If the RSS of particular node goes below the threshold level, the handoff must be initiated. Here RSS is calculated based on the BER.

HANDOFF INITIALIZATION

As soon as the RSS of the node reduces handoff is to be initialized. Or else it will lead to call dropping. Also handoff initialization should be done at correct time. If initialization is done prior it will lead to false handoff initialization and if it is done with delay of some time period it will lead to call dropping or call failure.

VANET SWITCHING CENTRE

In this scheme the Base Station (BS) and the VANET Switching Centre (MSC) analyses a call when it is expected to handover to another cell. Based on the frequency of the call mobility, the BS and MSC reserves Channels in the neighboring cells for expected Handoff. This reduces the dropping of ongoing call due to channel unavailability.

In this scheme, the VANET Switching Center (MSC) is responsible for the overall handoff decision

QUEUING

Thus after reserving the channel in the neighboring cell, the handoff call is to be served. In spite of serving the call immediately the node is put in the queue. The queue may contain several other calls. But the handoff call for which the channel is reserved is given higher priority. That is, this handoff call is made as the first input in the queuing system.

This is done because, if this handoff call is placed as last or intermediate input of queuing system, it will take several minutes to serve the handoff call, as the calls in the beginning of the queue must be served first. So in order to overcome this problem, this handoff call must be given as first input to queuing system.

HANDOFF DECISION

Thus the handoff call in the queue enters the reserved channel and by this handoff occurs. After the first call in the queue is been served, then the second call in the queue enters into its reserved channel thereby reducing the call dropping probability. This will enhance the overall performance.

In case if the queuing theory is not been used, the calls cannot be queued. If the channel is not reserved for handoff call, it will immediately lead to call failure reducing the overall performance. Because of the queue, even though the channel is not reserved it can wait in the queue for sometime until it gets channel for handoff. Thus this increases overall system performance.

IV.EXPERIMENTAL RESULT

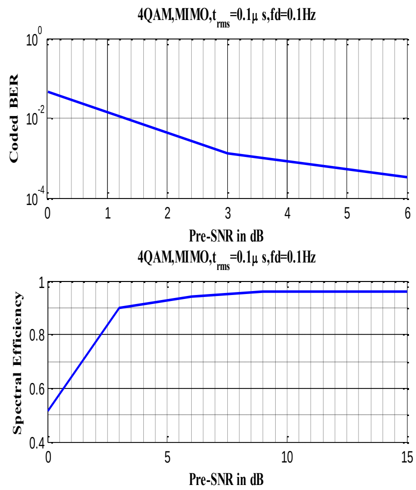

FIG 4: SPECTRAL EFFICIENCY AND BER

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The above graph shows the bit error rate of the communication system under various channel conditions described by SNR values. At 6db the BER reaches 10e-4, which is very appreciable least value. Anyhow this performance will vary if the VANET node is in movement with some velocity. But as per the theoretical approach, the BER will decay in the form of exponential curve which is well proved in the output.

The next figure shows how the spectrum is utilized effectively. Spectral efficiency of 0.98 is achieved at after 6db of channel SNR. So, from the graph is understood that channel conditions should be good in order to utilize the available spectrum effectively, otherwise the spectrum allotted will be of no use.

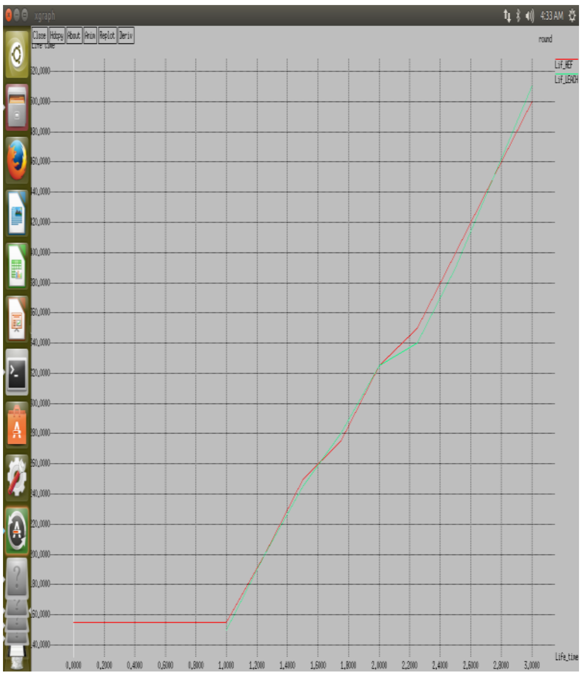

FIG 5: INCREASE IN THROUGHPUT

It is seen from the above graph that the throughput of the system increases with the channel reservation scheme. Hence call dropping and call failure probability decreases.

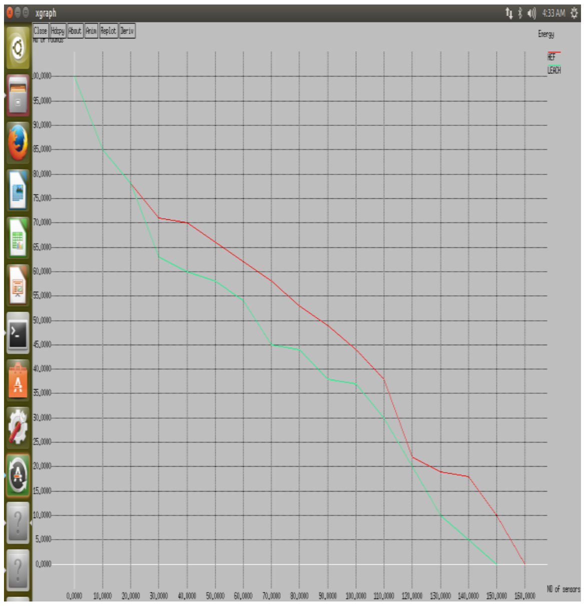

FIG 6: DECREASE IN DELAY

The above graph shows that the delay decreases. The delay here decreases as queuing theory is used.

V. CONCLUSION

In this project, we have shown how a VANET can be used to aid in traffic signal control using an effective handoff mechanism, and old job first scheduling algorithm. We implemented several adaptive traffic signal control algorithms that use the fine grain information broadcasts by the vehicles. The implemented protocol is compared with other existing protocols. It is noted that the Handoff and Old job first protocol reduces the delays experienced by the vehicles as they pass through the intersection, as compared with the other three methods under light and medium vehicular traffic loads. During the heavy traffic scenarios, the performance and Qos is high and still it is focused on reducing the delays. This is because, under lighter traffic, the OAF algorithm can dynamically skip through

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phases and minimize the delay of vehicles whenever there is a gap in the traffic. However, when the traffic gets heavier, the gaps in traffic disappear, and we always have queues on the approaches, reducing the advantage that a dynamic scheduling algorithm. Hence the delay is reduced with the help of queuing mechanism. The simulation results reveal that the proposed scheme reduces the dropping probability of handoff delays and guarantees QoS. The proposed scheme does not intend to increase the overall throughput in channel allocation but it outperforms the existing methods in handoff dropping rate.

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