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PERFORMANCE ANALYSIS OF GUARANTEED TIME SLOT MECHANISM FOR CLUSTER BASED ROUTING PROTOCOL IN MANET

V. Lalitha[1], B. Gopinathan[2]

[1,2]*Department of Computer Science and Engineering, Adhiyamaan College of Engineering, (India)*

ABSTRACT

Mobile Adhoc Network (MANET) is a self configuring network it does not have any infrastructure so it is called as infrastructure less network. In existing system, the Cooperative load balancing and dynamic channel allocation algorithm is used in the MANET with cluster formation, the bandwidth efficiency is improved. But the delay of packet is not reduced. Therefore, in proposed system the Guaranteed Time Slot (GTS) mechanism is used for each node in the network. GTS is suitable for transmitting time-sensitive data, it allocates time slots to a specific node. With that slot the nodes may transmit the packets in a timed manner. This will reduce the delay because, the packets are transmitted in a specific order. GTS mechanism prefers reliable communication with no loss and duplication of data but, the delay is viewed up to a certain level. With that more number of packets will be transmitted by consuming low energy from the nodes. This will increase the network performance so, that the throughput, packet delivery rate will increase and the delay is minimized in the clustered MANET.

Keywords: Bandwidth efficiency, GTS, MANET, Network Performance.

I. INTRODUCTION

Mobile Adhoc Network (MANET) is a self organizing network it does not have any pre fixed infrastructure so it is called as infrastructure less network. In mobile Adhoc network the mobile devices are connected by wireless links. The bandwidth efficiency and energy efficiency is the most important factor in Mobile Adhoc networks. The MAC (Medium Access Control) protocol will utilize the bandwidth in efficient manner. The MAC protocol for the wireless network is divided into two types based on its collaboration level namely coordinated protocol and uncoordinated protocol. The coordinated protocol is well suited for uniform load distribution whereas the non coordinated protocol is not fit for this uniform load distribution. The uncoordinated protocol shares the same channel by all other nodes that are presented within the network. So, that here the bandwidth is efficient for the low load networks. Group communication can be used for many applications in Mobile Adhoc Networks. In general, the Mobile Adhoc Network protocols can be classified into three types namely proactive or table driven, reactive or on-demand and hybrid protocols. In proactive protocols for each node to every other node it will maintain routing information in up-to-date manner whereas in reactive protocol it will update the routing information table only there is any changes are made. The hybrid will combine the nature of proactive and reactive protocols. The routing protocol used here is Adhoc On - Demand Distance Vector routing protocol and Destination Sequenced Distance Vector routing protocol. The AODV routing protocol creates routes

between nodes only the routes are requested by the source nodes. The AODV routing protocol will supports both the unicast and multicast. The term unicast means a small piece of information is sent from one place to another place. In unicast transmission the packet is sent from a single source to specified destination whereas in multicast a piece of information is simultaneously sent to group of receiver. The term channel sensing is used to detect the channel availability. The DSDV routing protocol maintains a routing table that consists of all available destination list and each destination have sequence number. If the packets are transmitted from source to destination by number of intermediate nodes are called as multi hop network. The Mobile Adhoc Network will provide communication to support for mission critical scenario that consists of military operations, search operations and disaster recovery operations.

II. RELATED WORKS

Bora Karaoglu, Member, IEEE and Wendi Heinzelman, Senior Member, IEEE has proposed the cooperative load balancing and dynamic channel allocation for cluster based Mobile Adhoc Network. This paper focuses on energy and bandwidth efficiency in clustered MANET. The Cooperative load balancing and dynamic channel allocation algorithms are used in order to improve bandwidth efficiency, throughput. But, delay of packet is not reduced.

Bulent Tavli and Wendi B. Heinzelman have proposed multi-hop time reservation using adaptive control for energy efficiency (MH-TRACE). In this paper they have proposed MH-TRACE it is an MAC layer that combines the features of centralized and distributed networks for energy efficiency in Multihop networks. But, here the channel allocation is not possible.

M.Felegyhazi, M.Cagalj, S.Bidokhti, and J.P.Hubaux have proposed Non-cooperative Multi-radio Channel Allocation in Wireless Networks. In this paper they have explained a problem of multiradio channel allocation. Here, the channel allocation shows a result of load balancing solution. There are three channel allocation schemes are used Fixed Channel Allocation (FCA), Dynamic Channel Allocation (DCA) and Hybrid Channel Allocation. In Fixed Channel Allocation same number of channels is permanently allocated and it will perform well under traffic load but it will not adapt to changing traffic conditions. To overcome this problem Dynamic Channel Allocation is proposed. In Dynamic Channel Allocation there is no constant relationship between base station and their respective channels all the channels are available for each base station and they are assigned dynamically. But, it performs worse than Fixed Channel Allocation in terms of heavy traffic load. The hybrid Channel allocation will combine the above two methods. The problem of this technique it is not fit for multi hop communication and the time delay will occur in terms of packet transmission.

Bora Karaoglu, Tolga Numanoglu has proposed the Analytical performance of soft clustering protocols. In this paper they presented an Analytical model that estimates the performance of MAC layer and also the concept of TDMA technique. The MH-TRACE cluster based protocol is used which is capable of supporting real time data transmission. They have the capability of estimating performance such as energy consumption for large set of parameters. The TDMA (Time Division Multiple Access) is used for assigning time to the frames for transmission. So, that delay is much reduced and also throughput will be increased. But each node consumes more energy. And also it does not give better performance for large number of clusters.

Celimuge Wu, Kazuya Kumekawa, and Toshihiko Kato have proposed A MANET protocol considering link stability and bandwidth efficiency. Based on Adhoc on-demand distance vector routing protocol (AODV) they increase the bandwidth efficiency. For selecting a route they use Q- Learning algorithms this will increase the bandwidth efficiency and also it will reduce the number of route errors. But, it is used only for the communication. This method is not fit for multi hop communication.

JiaweiXie, Amitabha Das, Sukumar Nandi , Anil K. Gupta have proposed Improving reliability of IEEE 802.11 In this paper they have introduced a Broadcast scheme for Multicasting in Mobile Adhoc networks. Multi casting in Mobile Adhoc Networks are mainly based on MAC layers. Here, the RRAR (Round Robin Acknowledge and Retransmit) mechanism is used. If any packet is lost during packet transmission between source and destination means it will retransmit the packet again. So, reliability is improved and also delay is reduced. Each node consumes more energy for transmitting the packet. This literature survey says about the problem of packet delay during packet transmission and also the problem of energy consumption. In our proposed systems, that delay of packets will be reduced, and the nodes energy consumption will be reduced.

III. SYSTEM MODEL

In this section we are going to explain the concepts of Cooperative load balancing and dynamic channel allocation algorithm along with Guaranteed Time Slot (GTS) mechanism. Here, we have mentioned some key terms that is related with this research.

3.1 Single Hop Network

The Single hop network has direct communication between source and destination. There are no intermediate nodes between the source and destination. In existing system, the performance of dynamic channel allocation is compared with the single hop network.

3.2 Multi hop Network

The term Multi hop network means it does not have direct communication between the source and destination nodes. In other words, with the help of number of intermediate nodes the packets will be transmitted from source node to destination node are called as multi hop network.

3.3 Cluster formation

In this module the group of similar nodes forms into a cluster. It means based upon the energy level of the nodes the clusters are formed.

3.4 Cluster Head

The cluster head is also called as Coordinator. It will monitor the overall network status. The channels are allocated to the nodes by channel coordinators. And also the channel coordinator will maintain and distribute the resources among all the nodes that are presented within the network. Here, the cluster head will check for the load if the load is exceeds means it will shift their load to another neighbor node which has more energy with the help of load balancing algorithm that are mentioned below.

In our proposed system, along with Guaranteed Time Slot (GTS) mechanism the cooperative load balancing and dynamic channel allocation algorithms are used.

IV. ALGORITHMS

4.1 Dynamic Channel Allocation algorithm

The Dynamic Channel Allocation algorithm is used to sense the transmission range. In this algorithm, the channel coordinator frequently monitors the power level of all available channels that are presented within the network and then it accesses the available channels. If the channel controller load increases means it starts using of additional channel that has lowest power level.

4.2 Cooperative load balancing algorithm

In Cooperative load balancing algorithm the nodes select their channel provider based on the available resources.

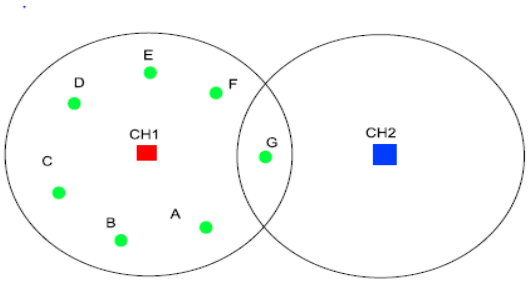

Fig 1: Demonstration for the cooperative load balancing algorithm.

Here, the one who have more number of resources are assigned as a cluster head. The Cluster Head is otherwise called as Coordinator. Then, the Cluster head load increases means it will shift their load to next neighbor cluster that has more number of available resources.

4.3 Guaranteed Time Slot Mechanism

The Guaranteed Time Slot (GTS) mechanism is used to transmit time sensitive data and also the nodes get acknowledgement about the data. Here, the GTS will allocate time slots to each specific node in the network. GTS mechanism gives reliable communication with no loss and no duplication of data.

V. SIMULATION RESULTS

In this system, we use NS2 (Network Simulator Version-2) simulator in order to evaluate the performance of the proposed system compared with the existing system. The System model is briefly discussed with this section. Based upon the mobility nature of the Mobile Adhoc Networks here, 50 nodes are created. After, the node creation within the network the communication between the nodes is performed. And then the nodes are formed into clusters, after the cluster formation the channel allocation algorithm is applied so, that it will sense the transmission range. After that, the load balancing algorithm is used it will create the Cluster head (CH) consisting of more number of available resources. Then, it will check for the load if the load exceeds the capacity means it will shift their load next neighbor cluster that has more number of available resources. Finally,

the Guaranteed Time Slot (GTS) mechanism is used. Here, time slot is given to each node. That will transmit the packet in timed manner. And also the node consumed low energy with that maximum number of packets is transmitted. The parameters that are used in the system for the performance evaluation is throughput, delay, network lifetime and packet delivery ratio. Here, the performance of proposed system is analyzed with the system.

5.1 Packet Delivery Ratio

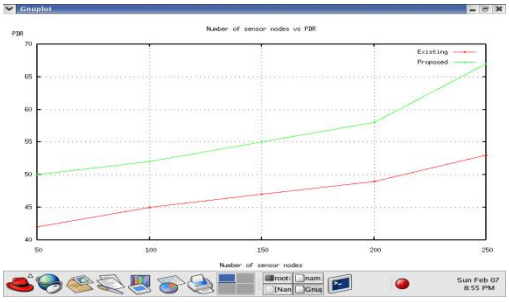

Fig 2: Number of sensor node Vs PDR

The performance of packet delivery ratio is compared with the existing system. Here, the packet successful delivery ratio is significantly increased than the existing system.

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5.2 Delay

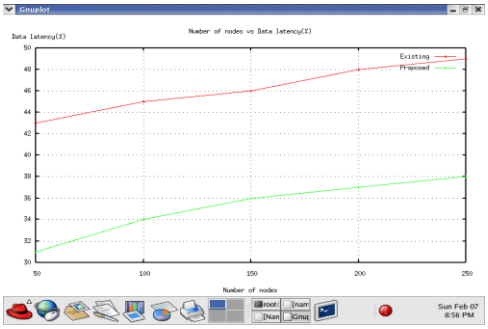

Fig 3: Number of sensor node Vs Delay

In the above figure 3, the performance of delay is described. The packet delay is minimized than the existing system with the help of Guaranteed Time Slot mechanism.

5.3 Throughput

The number of successful transmission of packet transmission is called as throughput. In the below figure, the node speed is compared with average throughput per flow.

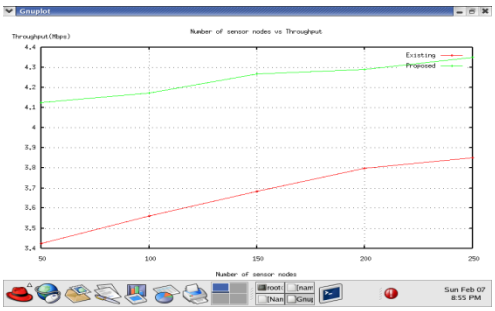

Fig 4: Number of sensor node Vs Throughput

Here, more number of packets will be transmitted in our system. So, that the throughput is increased than the existing system.

5.4 Network life time

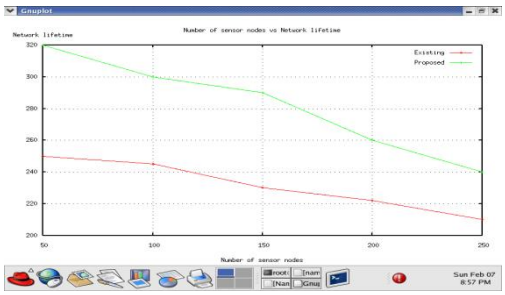

Fig 5: Number of sensor node Vs Network Life time

In the above figure 5, the performance is analyzed with the overall network performance. This will increases the overall performance of the network.

5.5 Energy

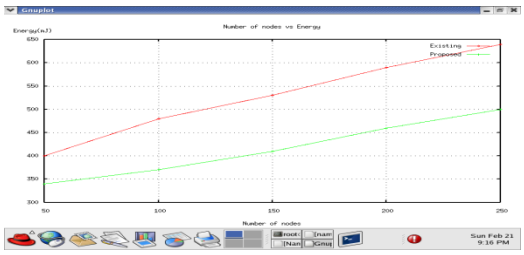

Fig 6: Energy Consumption

In the existing system, the node consumes more energy during packet transmission. But, here in proposed system the node consumes low energy that will maximizes the packet transmission.

VI. CONCLUSIONS

This paper focused on energy and bandwidth efficiency. The energy and bandwidth efficiency is one of the main issues in Mobile Adhoc Networks. To overcome this problem, along with Guaranteed Time Slot (GTS) mechanism Cooperative load balancing and dynamic channel allocation algorithms are used. This will transmit the packets in timed manner. And also node will consume low energy for packet transmission. The result shows that the energy efficiency is improved. So, that the throughput, packet delivery ratio is increased and delay is reduced. Then, the overall network performance is also improved. Here, in this paper the channel handover is not implemented. In future, the channel handover is going to be investigated.

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