

Channel Allocation in Mobile Adhoc Network through Scheduled throughput

Muralidharan R

Dean – Department of Computer Science, E. S. Arts and Science College (Co-Ed), Villupuram.
murali79npm@outlook.com

Abstract—A MANET is an autonomous system of mobile nodes. The system may operate in isolation, or may have gateways to and interface with a fixed network. In the latter operational mode, it is typically envisioned to operate as a “stub” network connecting to a fixed internet work. Stub networks carry traffic originating at and/or destined for internal nodes, but do not permit exogenous traffic to “transit” through the stub network. Routing algorithm plays an vital role in Mobile Ad hoc Networks. In this paper strategies in channel allocation using scheduled throughput is compared with the existing channel allocation method.

Index Terms— Channel allocation, MANET, Scheduled Throughput.

I. INTRODUCTION

Mobile Ad Hoc Networks (MANETs) are infrastructure-less, self-configuring wireless networks which enable peer-to-peer communication between mobile nodes without centralized control. It considers the mobility of the nodes in the ad hoc setup. Nodes are able to communicate beyond their transmission range via multi-hop communication. Due to the intrinsic limitation of transmission range, each wireless node is responsible for dynamically discovering and associating with other nodes with a view to establish a communication. MANET Node operates in distributed manner on time varying wireless communication on available bandwidth. A node acts as router to forward packets between each other [1]. In Some cases, node mobility may cause route changes. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. In ad hoc environment, as the mobile hosts have limited transmission range, it may be necessary for one mobile host to enlist the aid of other hosts in forwarding a packet to its destination. Each must forward traffic unrelated to its own use, and therefore be a router.

The communication channels between the nodes presented in the network are unreliable in which higher bit errors are incurred compared to wired networks. Ad-hoc networks are suitable for areas where it is not possible to set up a fixed infrastructure. Since the nodes communicate with each other without an infrastructure, they provide the connectivity by forwarding packets over themselves.

In simple words, routing can be termed as a procedure of discovering paths along which the data communication between the nodes in the network is realised. Routing in MANETs comprises of two entities:

- Acquisition and dissemination of the state information of the nodes and
- Using this information to discover optimal routes that satisfies one or more constraints and provides QoS.

Due to the aforementioned limitations of MANET, the routing protocols used in wired networks like the Ethernet cannot be directly implemented. Over the past years, routing in MANETs has become a challenging and non-trivial issue and as a result significant numbers of proposals were proposed focussing on developing different routing protocols for MANETs.

Routing protocols of the Mobile Adhoc network can be broadly classified into four types such as Proactive, Reactive, Hybrid and Hierarchical.

A. Problem Statement

Channel allocation is considered as the problem statement and the proposed work provides a solution. Network issues arise in the routing protocol due to the lossy nature of the propagation medium and multiple devices can use the same channel resources in spatially remote locations with minimal effect on each other. Routing file is established in order to collect the carrier or channel sensing node information in order to form the channel state information. The objective is to increase the scalability by generating the multiple cluster head to the clustered nodes and desirable number of common channels for control. It facilitates the graceful channel migration between one another to form dynamic migration zones towards dissemination and dynamically reforms to each node's bandwidth requirement, energy use, and application type. The proposed protocol maximizes the spatial reuse and provides support for non-uniform load distributions as well as supports multicasting. Multicasting allows sending a single packet to multiple recipients in the same allocated channel. In case of load balancing, the trace file collected from the cluster head in the mobile nodes is merged and analysed for efficient path prediction. The research on the Mobile Adhoc Network is carried out to attain effective load balancing and channel allocation.

II. LITERATURE REVIEW

Routing Protocol of the MANET in the existing work is analyzed and presented as follows:

"Location-Based Efficient Routing Protocol" discusses about dynamically partitions of the network field into zones and randomly chooses nodes in zones as intermediate relay nodes, which form an effective route[(Arun Kumar et.al , 2017)]. It also has strategies to effectively counter intersection and timing attacks. Experimental results exhibit consistency with the theoretical analysis, and show that protocol achieves better route discovery and lower cost compared to other routing protocols. Also, protocol achieves comparable routing efficiency to the GPSR geographical routing protocol.

"Channel-Aware Routing in MANETs" discusses about packet transmission impaired by radio link fluctuations. In this literature , channel adaptive routing protocol which extends the Ad hoc On-Demand Multipath Distance Vector (AOMDV) routing protocol to accommodate channel fading is considered for discussion(Xiaoqin Chen et.al , 2016). Theoretical results for the downtime and lifetime of a live-die-live multiple path system, as well as detailed theoretical expressions for common network performance measures, providing useful insights into the differences in performance between CA-AOMDV and AOMDV are presented. Simulation and theoretical results show that CA-AOMDV has greatly improved network performance over AOMDV.

"Cluster overlay broadcast Routing" discusses about time and message complexities that are probably low and independent of the total number of nodes in the network .In this literature design and operation of very large scale wireless mobile ad hoc networks is modelled using Cluster Overlay Broadcast (COB), a low-complexity routing algorithm for MANETs. It executes on top of a one-hop cluster cover of the network, which can be created and maintained using, for instance, the Least Cluster Change (LCC) algorithm. LCC algorithm maintains a cluster cover with a constant density of cluster leaders with minimal update cost. It discovers routes by flooding (broadcasting) route requests through the network of cluster leaders with a doubling radius technique (L. Ritchie et.al, 2006).

"Self-Repairing Tree Topology Enabling Content-Based Routing in Mobile Ad Hoc Networks" discusses about Content-based routing (Luca Mottola et.al, 2008). It provides a powerful and flexible foundation for distributed routing .Implicit addressing and fosters decoupling among the communicating components is major functionality for the efficient data transmission.

III. METHODOLOGY

Extensively deployed networks use both fixed and dynamic controllers to determine how the channel is shared and accessed. In addition channel accessing protocol undergoes challenges in maximization of load scheduling and providing support for non-uniform load distributions. In this paper the strategies for channel allocation using Scheduled throughput in Mobile Adhoc Network on various traffic patterns is modelled. In this model, Routing

file is established in order to collect the carrier or channel sensing node information to form the channel state information. The objective is to increase the scalability by generating the multiple cluster head to the clustered nodes on desirable number of common channels for control. It facilitates the graceful channel migration between one another to form dynamic migration zones towards dissemination and dynamically reforms to each node's bandwidth requirement, energy use, and application type. It provides efficient use of the network resources and it eliminates the need for multiple transmissions of an identical payload [2]. In this model, the number of channels is adaptive (based on the load), allowing two channels of the same frequency carrier to be used in two neighbouring nodes on the channel switching. The concept of channel hopping is carried out on the basis of dynamic behaviour of the network in terms of time/frequency division. Bandwidth efficiency on optimal channel allocation is subject to delivery probability and throughput constraints on the dynamic nature of traffic load. It also dynamically adjusts the transmission order of the nodes and transmission duration based on channel state information.

Mobile Ad hoc Networks is established as undirected graph to assign a unique ID with IP address towards transmitting and receiving the data packets among source and destination nodes[9]. The node continuously maintains the information required to properly route traffic. It also dynamically adjusts the transmission order of the nodes and transmission duration based on channel state information.

The design specifications mentioned below are considered for the development of clustering of the nodes of the MANET network. The fundamental aim of the proposed clustering algorithm shall be to address the greedy approach. The greedy approach is characterised by implementing a local minima concept which uses frequent event-driven broadcast to select the Cluster Heads (CHs). The CHs and the subsequent clusters generated by such an approach have a tendency to produce a backbone network that is arbitrarily inferior to optimum. Consequently, the overhead in the network escalates resulting in degradation of the energy resources [10]. Greedy approach to model reduces the energy consumption of battery driven nodes of the MANET by modifying the location of the nodes.

Considering evolution of the network during a certain time interval to compute the proximity criteria and then using it in cluster formation and CH selection procedure may result in generating stable clusters. Specifying large number of clusters may result in generating clusters with low node density.

A. Cluster formation – Cluster head Representation

The clustering of the nodes becomes an important mechanism to build up a hierarchical structure to alleviate the network overhead in a large-scale network node to continuously maintain the information required to properly route traffic. On this cluster Head selection is a primary criterion to be considered to determine the co coordinator for the cluster [11]. The figure 3.1 represents the clustering representation of the nodes.

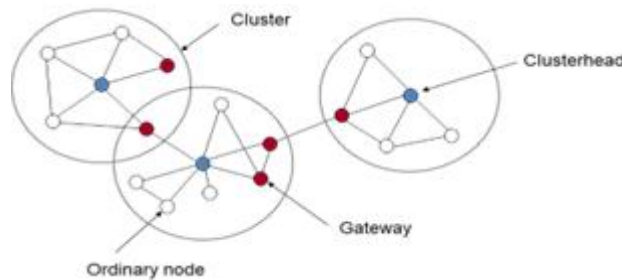


Figure 3.1: Clustering of the MANET

CH selection criteria for greedy based clustering algorithms are:

- Node with maximum number of reachable neighbours
- Node with minimum value of aggregate relative mobility related to its neighbours
- Node with minimum value of aggregate transmission power level required to reach its neighbours and
- Node with maximum value of the objective function.

All CHs send out periodic Beacon packets to announce their presence to the nodes in their neighborhood. When a node does not receive a Beacon packet from any CH for a predefined amount of time, it assumes the role of a CH.

Where $\Lambda = \frac{p(y|H_1)}{p(y|H_0)} \geq u$
 $P(y|H_1)$ is considered as probability of the node for the packet transfer at instance 1

$P(y|H_0)$ is considered as probability of the node for the packet transfer at instance 0

U is threshold value of node behaviour to consider as cluster head

The strategies deriving objective is to increase the scalability by generating the multiple cluster head to perform the channel migration between one another to form dynamic migration zones to facilitate the information dissemination [12]. The channel resources are managed in terms of resource file to form channel state information on extracting the channel state information by the cluster head against the uniform and non uniform Traffics. The Cluster Head selection coordinates the nodes' access to the shared radio channel, minimizing conflicts for scheduled throughput for multi data synchronization as shown in system model in figure 3.2.

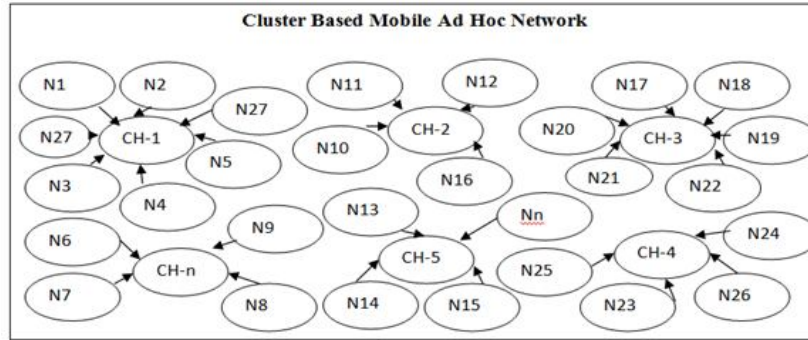


Figure 3.2: System Model

The channel allocation strategies depend on bandwidth and load using channel coordinator by sharing common channel resources, reducing the resources available for data transmission. The interference relationships between channel coordinators are highly dynamic and adopt a dynamic channel borrowing scheme. The context-modelling technique from theoretical information science domain is used to establish a strong correlation between movements of nodes for accurate prediction of future mobility.

Channel controllers continuously monitor the power level in all the available channels in the network and assess the availability of the channels by comparing the measured power levels with a threshold. Once the channel coordinator starts using the channel, its transmission increases the power level measurement of that channel for nearby controllers, which in turn prevents them from accessing the same channel. Similarly, as the local network load decreases, controllers that do not need some channels stop the transmissions in that channel, making it available for other controllers [13].

IV. RESULT AND CONCLUSION

In this work, a strategy for channel allocation in Mobile Adhoc Network under uniform and non uniform network loads has been designed. The coordinated channel accessing has shown to be effective reducing the overhead of the channel bandwidth. The clustering provides better way for channel utilization during any load balancing and channel hopping. Utilizing the effective strategies maintains its stability on transferring the load by providing channel handover capability. CHs may reserve a certain percentage of resources for transfers by allowing the network to prioritize the data request. With the NS2 simulator, the work had been tested with 200 nodes and the bandwidth of 2MBPS.

The Source node is selected randomly to transmit the data of size, it is initialized to send route request packet to base station or intermediate after every 10s and path of network has to be selected with reference to the intermediate node against the node density and energy levels of the nodes. Node traffic is produced with constant bit rate (CBR). The generation rate of the CBR is 150kb/s. Each protocol is simulated 10 times with different packet in order to eliminate the effect of the stochastic nature of some simulation events. Performance of the network simulated is assessed via., throughput, Delay, Packet Delivery Ratio and Overhead against the data traffic and packet request is computed.

The Proposed strategies for Channel Allocation protocol using Scheduled throughput extend the Distributed Channel Access protocol through inclusion of Access point Selection and Data compression mechanism. The proposed protocol is used to improve the network performance through proper channel coordination between clusters based nodes. The evaluation of the proposed model against the synchronization strategies on during the data propagation process has been determined and depicted in the figure 4.1.

Throughput of the network results as it is determined by placing the probability estimators placed each link towards the channel allocation to the dynamic loads. Increased Node density decreases the overhead of the network using packet scheduling algorithm and bandwidth compression constraints. The packet delivery ratio of the proposed methodology has been depicted in the figure 4.2.

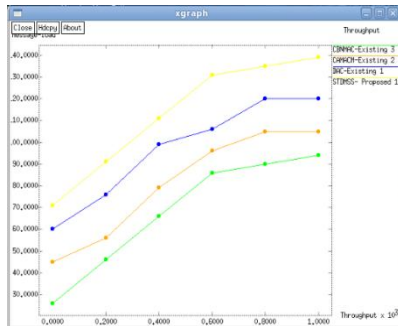


Figure 4.1. Throughput analysis of proposed Methodology

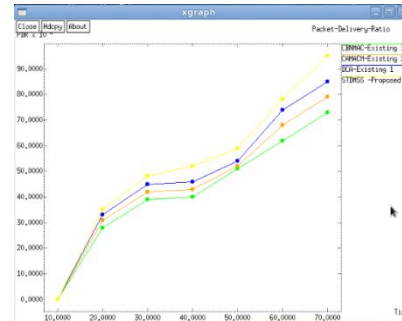


Figure 4.2. Packet Delivery Ratio Analysis against the Data Traffic

With low node mobility, routing paths break down infrequently which results in failure packet delivery ratio on the scheduling of the dynamic load to time varying channels[14]. Higher node mobility makes the path maintenance overhead rate dominate the entire overhead rate which is due to high rate in packet delivery ratio for data exchange. The delay resulted from the path searching degrades the ability to meet the channel utilization requirements.

The race condition problem further decreases the channel throughput as the same resources are reserved for different source nodes at the same time for network loads. Then some source nodes cannot obtain the resources as scheduled on basis of the priority and queuing strategies.

The Overhead of the network results as it is determined by placing the probability estimators placed each link on time varying loads. Increased Node density decreases the overhead of the network using packet scheduling algorithm and bandwidth compression constraints in proposed protocol as depicted in the figure 4.3.

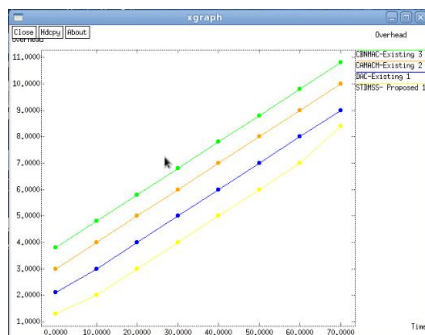


Figure 4.3. Overhead Analysis against the Data Traffic

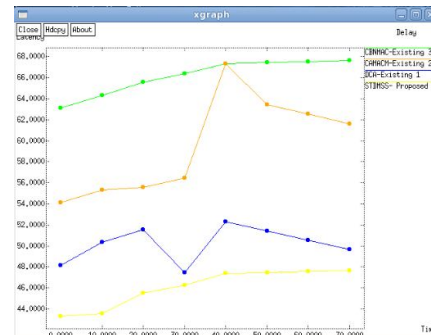


Figure 4.4: Performance Analysis of proposed model on delay

However, system fails to utilize entire size of the packet too small because it generates more packets to be transmitted, producing higher packet overhead. Packet delivery ratio is defined as the ratio of the number of Sensor information successfully received by the destinations of the mobile sink to the destination to the number of data packets generated by the source node in the network.

The figure 4.4 demonstrates the performance of the delay on multicast routing. The Routing Latency is largely affected by the overall traffic in the network, hence it is controlled by inclusion of the effective strategies in the channel allocation through placement of access point. In parallel, data routing mechanism is defined strong to handle additional complication of the node. From Simulation analysis it is proved that energy utilization and throughput maximization through employment of optimal solution for channel access has improved as compared against state of routing protocol and also performance evaluation depicts the scalability and reliability of the evaluated framework.

Performance of the Mobile Adhoc Network is related to throughput and energy constraints is presented and the proposed methodology is effective compared to existing routing protocols. Normally sensor nodes consume

energy at different rates during transmission and reception. Node density is determined across the network in order to avoid the fault in the network.

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