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Load Balancing Using MACRO Approach

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ABSTRACT

Mobile ad hoc networks (MANETs) are becoming more common technology, and characteristic network loads consider for MANETs are increasing as applications evolve. Due to the dynamic behavior in MANETs, the traffic load may be highly non-uniform over the network area. DCA-TRACE ( ) is used to allocate a channel dynamically and routing layer to balance the load. To improve performance in terms of throughput, energy consumption, inter-packet delay variation (IPDV) and bandwidth effectiveness in cluster based MANET. Hence, the combination of these above two layers, we framed a new MACRO approach to give better performance for Cluster based MANET.

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INTRODUCTION

Mobile ad hoc networks (MANETs) have been an central class of networks, providing communication support in mission important scenarios including Battle field and strategic missions, search and rescue operations, and disaster recovery operations. Group communications has been necessary for many applications in MANETs. The typical number of users of MANETs has continuously increased, and the resource becomes more competitive to support all those applications providing by these Mobile ad-hoc networks. Thu bandwidth efficiency becomes more important aspect in MANETs. MAC protocol faces the challenges of adapting in Dynamic environment and also managing the bandwidth utilization. In general, MAC protocols for wireless networks can be separated as coordinated and uncoordinated MAC protocols based on the collaboration level. In uncoordinated protocols such as IEEE 802:11, shares the same channel with all the nodes in the network. Bandwidth is efficient and overhead is low for low network loads compared with high load networks. The process of sending a packet to the multiple destination address is known as multicasting. The multicasting service is needed for efficient utilization of resources also it reduces the overhead of transmission to multiple recipients.

Whenever a MANET node switches from one gateway to another gateway a new address is obtained and the present address is overwritten by the new address. The dynamic host configuration protocol is responsible for assigning the new address to the MANET nodes. When connected to the internet, the ad hoc network can be seen as a detach routable subnet. This simplifies the decision if a node is inside or outside the ad hoc network. However, no competent solutions are present for selecting dynamically a suitable, externally routable and unique network prefix, handling the merging or splitting of ad hoc networks, handling multiple access points to the Internet. The security challenge also increases with the wireless mobile ad hoc environment of MANETs. As the wireless medium is susceptible to eavesdropping and the ad hoc network functionality is recognized through node cooperation, mobile ad hoc networks are fundamentally exposed to large number of security threats. The attacker who listens the network to collect the valuable information is known as passive attacks. The passive attacks are not easy to detect since it does not create any extra traffic in the normal network traffic. Whereas, the active attacks involves modification, altering, replicating and deleting valuable information in a network by getting into the network infrastructure. These types of attacks are easier to detect but difficult to prevent from these types of attacks. Keeping MANET secure against these types of attacks is a challenging task to achieve. Prevention mechanisms includes authentication of message sources, data integrity and protection of message sequencing, and are typically based on key-based cryptography. These preventative mechanisms need to be followed by detection techniques that can

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detect the attacks which are trying to penetrate in to the network. To deal with these troubles, the self-organizing network model must be based on an incentive for users to work together, thereby avoiding egocentric activities. Existing solutions aims at identifying and separating selfish nodes based on watchdog mechanisms, which identify misbehaving nodes, and standing systems, which allow nodes to separate selfish nodes. Another approach is the beginning of a billing system into the network based on economical models to implement cooperation. Also, when an Ad hoc networks are interrelated to fixed infrastructures by gateway nodes for making these services available. To this end, appropriate business scenarios, applications and economical models need to be recognized, together with technological advances, making a conversion of ad hoc networks to the commercial world viable.

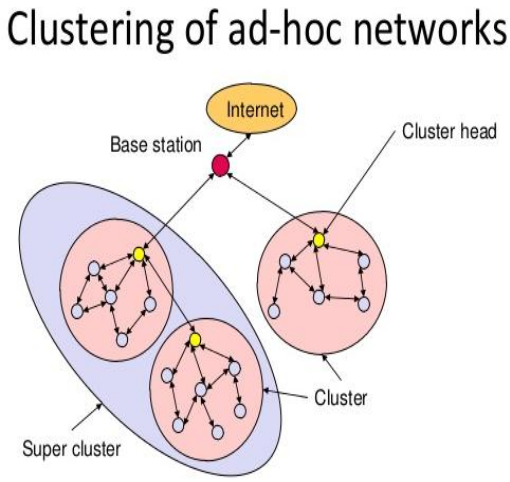

Fig. 1: Cluster-Based Mobile Ad hoc Networks.

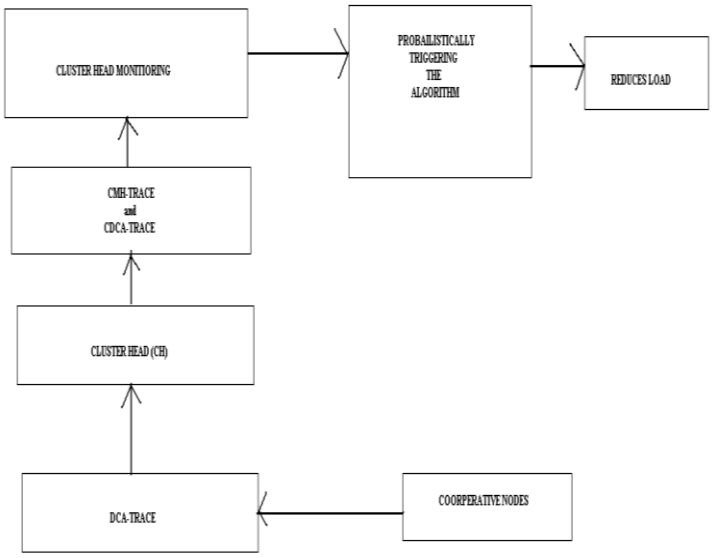

Fig. 2: Load Balancing in MANET.

Load balancing in Manet:

Computer network is one of the most sophisticated systems which routes millions of packets from one to another nodes in each and every second. The data must be routed effectively to the different nodes in order to handle huge volume of packets. Load balancing is a technique used to equally distribute the traffic to the nodes in order to avoid the unnecessary congestion over the network. So that none of the nodes are overwhelmed by the received packets. This allows them to use the available bandwidth more efficiently, and therefore provides faster access to the websites they host. The load balancing requires the software and hardware which are used to split the traffic equally between the nodes and this load balancing is performed on local network or in a web server. Networks that receive high amount of traffic may even have one or more servers dedicated to balancing the load among the other servers and devices in the network. The servers are often called load balancers. Then odes are arranged in various different positions so that the

process of load balancing becomes more challenging for the mobile ad-hoc networks. In ad hoc networks load distribution can be categorized in to uniform load distribution and non-uniform load distribution. Due to the dynamic nature of the MANET, the network load oftentimes is not uniformly distributed. Load imbalance is one of the critical issues in these networks and the network performance can be reached by fairly allocating load among nodes within the network. The significant of an efficient load balancing technique is to minimize the difference between the overloaded and under loaded nodes in terms of their workload by keeping other parameters in concern. The process of balancing the networks becomes more difficult because of frequently changing parameters. Failed to balance the network will result in significant delay, more energy consumption and packet dropping. Load balancing is the scheme used to allocate the load of network equally thereby avoiding the congestion over the network. The routing protocols in MANET that choose the shortest route to build up the communication path may incur traffic imbalanced problems in the network. The overall purpose of various load balancing schemes is to select non-congested paths or to disseminate excessive load of a node to its neighbors.

Related work:

MAC protocols for wireless networks can be segregated as coordinated and uncoordinated MAC protocols. Due to the absence of dynamic channel allocation it is not suitable for non-uniform load distribution. MAC protocols bandwidth efficiency decreases when switches form low load network to high load network. Also it does not support multicasting. In cellular networks also use a synchronized MAC protocol in which the channel access is synchronized through fixed base stations. Networks act as a stagnant supportive game, in which some players collaborate to achieve a high data rate. However, these approaches are not scalable, as the complexity of the dynamic channel allocation problem is denoted by NP-hard. In exiting system occur deals with the hidden terminal difficulty and non uniform load distribution in mobile ad hoc networks.

In this paper, we tries to increase the bandwidth efficiency using MACRO approach using routing layer along with MAC layer. We use a light weight dynamic channel allocation scheme for cluster-based mobile ad hoc networks; we propose a cooperative load balancing algorithm. We incorporate these two algorithms into our earlier TRACE framework leading to DCA-TRACE and CMH-TRACE. We merge both algorithms to offer maintain for no uniform load distributions and propose CDCA-TRACE. This MACRO approach can able to handle the Efficient Bandwidth, High energy level, Packet transfer delay and failure. To solve the issue of channel assignment when there is a single intended destination of each transmission and they do not cover group communications. In many cases, using link layer multicasting and broadcasting improves the efficient use of network resources. Indeed, many MANET applications such as military field communications and inter vehicle communication systems make use of broadcast services. In this paper, we particularly focus on link layer broadcasting and consider MANET scenarios where the destination of the generated packet is not a specific node in the local area but all the nodes in the instant region of the transmitter.

Proposed work:

The following are the modules of the project; 1.Cluster based MANET, 2.MAC layer protocol, 3.Routing layer protocol 4. MACRO approach.

A. Cluster based manet:

The size of the region over which the nodes are located, the number of nodes in the network, and their data generation patterns are all important in optimizing the design parameters. A mobile ad hoc network is an autonomous collection of mobile devices (laptops, smart phones, sensors, etc.) that communicate with each other over wireless links and cooperate in a distributed manner in order to provide the necessary network functionality in the absence of a fixed wired network. This network, will act as a stand-alone network with one or more access to cellular networks that paves the way for many new and exciting applications. Due to the dynamic nature of MANETs this information might not be available a priori, and some of these parameters may change over the course of the network lifetime. It is necessary for the protocols to dynamically adjust to changing conditions. In MAC protocols, it minimizes or eliminates collisions by allocating dedicated channel resources to transmitters.

B. Mac layer protocol:

In Mac Layer Protocol, DCA-TRACE (Dynamic Channel Allocation) Algorithm used to allocate the channel dynamically. DCA-TRACE algorithm contains four types of slots: Contention Slots, CA Slots, IS Slots and Data Slots. Contention slots are utilized by the nodes to send their channel access requests to the CH (Cluster Head). The CA slot is used for interference estimation for CHs operating in the same region. During the IS slots, nodes send short packets summarizing the information that they are going to be sending in the corresponding data slot. Another use for the IS packets is to notify the CH about the utilization of the slot by the assigned node. A lightweight dynamic channel allocation mechanism with MH-TRACE and DCA-TRACE those are applicable to cluster based MANETs for better performance under non-uniform distribution. Cluster-Head continuously monitor the availability of

the nodes in the network. Based on the information provided by those slots the Cluster-Head allocate the channel dynamically to the nodes.

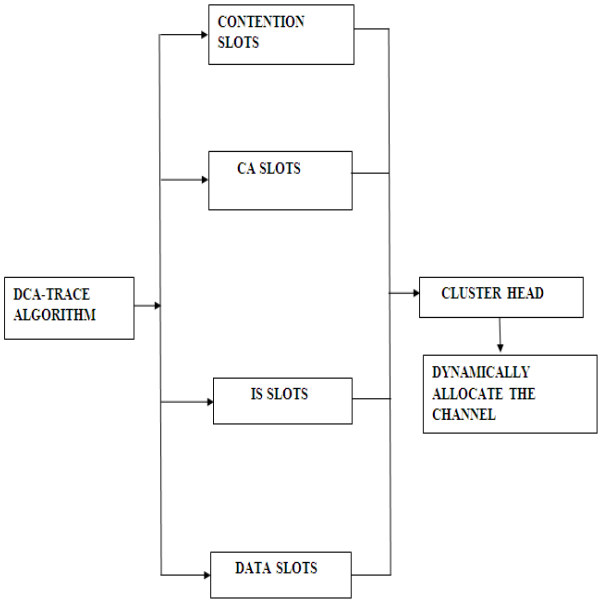

Fig. 3: MAC Layer Architecture.

C. Routing layer protocol:

In this paper, Routing layer is used to balance the load in the network. Mobile ad hoc networks are characterized by a multi-hop network topology that can change frequently due to mobility; efficient routing protocols are needed to establish communication paths between two nodes, without creating unnecessary traffic overhead or computational load on the power constrained devices. These protocols are known as proactive protocols. These protocols are enhancements made on the traditional DVR(distance vector routing)and link state routing protocols. The major task of the routing protocol is to discover the topology to ensure that each node can acquire a recent map of the network to construct to its destinations. Proactive Routing Protocol such as OLSR (optimized link state routing) protocol, nodes obtain routes by periodic exchange of topology information with other nodes. It maintains route information at all the time OLSR protocol achieves optimization through the use of multipoint relay (MPR) to provide an efficient flooding mechanism by reducing the number of transmission required. Using MPR, each node declares its links and forwards the messages for their neighbors.

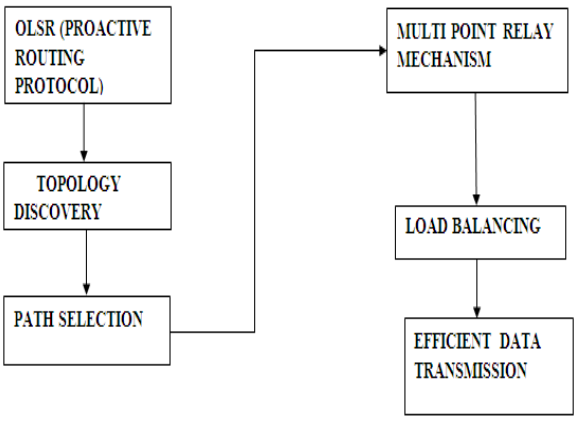

Fig. 4: Routing Layer Architecture.

D. Macro approach:

The typical numbers of users of MANETs have continuously increased, and the applications supported by these networks have become increasingly resource intensive. Thus in turns increase the importance of bandwidth efficiency, energy level, delay. Due to the dynamic nature of the MANET the traffic load may be highly non-uniform

over the network area. It is crucial that the MAC protocol be able to efficiently handle spatially non-uniform traffic loads. So we propose the approach called MACRO to balance the load during non-uniform load distribution in MANET. MACRO Approach is the combination of MAC layer protocol and routing layer protocol. MAC Protocol is used to allocate the Channel dynamically and routing protocol is used to balance the load. Using DCA-TRACE algorithm for channel allocation and OLSR proactive routing protocol is used to balance the load in the network. This MACRO approach increases the efficiency of bandwidth and decrease inter-packet delay variation under non-uniform load distribution in Cluster-based MANET. MACRO Approach is used to increase the performance in terms of throughput, energy consumption, inter-packet delay variation (IPDV) and bandwidth efficiency in cluster based MANET.

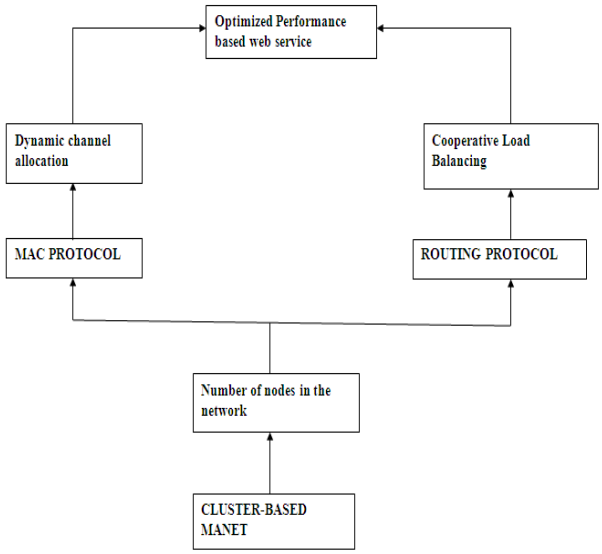

Fig. 5: Components of proposed system.

Conclusion and future enhancement:

In this paper, we studied the problem of non-uniform load distribution in mobile ad hoc networks. We proposed a light weight dynamic channel allocation algorithm and a cooperative load balancing algorithm. The dynamic channel allocation works through carrier sensing and does not increase the overhead. It has been shown to be very effective in increasing the service levels as well as the throughput in the system with minimal effect on energy consumption and packet delay variation. The cooperative load balancing algorithm has less impact on the performance compared to the dynamic channel allocation algorithm. We showed that these two algorithms can be used simultaneously, maximizing the improvements in the system. The combined system has been shown to perform at least as well as the systems with each algorithm alone and performs better for many scenarios.

In this paper, we focused on bandwidth utilization and leave full adaptation of the system for delay sensitive communications as future work. For instance,"channel handover" is not implemented. Systems incorporating channel handover provide uninterrupted channel access for source nodes that travel away from one channel coordinator towards another one by transferring their load. The cooperative load balancing algorithm can be extended to provide such channel handover capability. In this provisioned system, moving active nodes are required to change their channel coordinator not only based on the load on the channel coordinators but also based on the RSSI measurements of Beacon packets from each channel coordinator.

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