ABSTRACT

Wireless mobile ad-hoc networks is increasingly common typical network loads consider for MANETS as applications evolve the importance of bandwidth efficiency while maintaining tight requirements on energy consumption delay and jitter. Access protocols have been shown to be well suitable and highly loaded adhoc networks under uniform load distribution. These protocols are in general not as well suited for non-uniform load distributions as uncoordinated channel access protocols due to the lack of on-demand dynamic channel allocation approach based on lack of demand dynamic channel allocation coordinated protocols. Our analysis highlights the light dynamic channel approach and cooperative load balancing strategy applicable to cluster based Mobile Ad-hoc networks to improve the bandwidth efficiency under non-uniform load distribution to protocols that uses the mechanism to compare the IEEE 802.15.4 protocol with GTS mechanism uncoordinated protocol.

Keywords – Wireless Mobile Ad-hoc Networks, Load Balancing, Multi-hop Networks, IEEE 802.15.4, MH TRACE

SECTION I

1. INTRODUCTION

World-wide web has been developed for more than forty years recently many researchers are studying networks based on novel communication techniques, especially wireless communications which allow hosts to roam without the constraints of wired connections. People can deploy a wireless network easily and quickly. Hosts and routers in a wireless network can move around. In the recent years Mobile Ad-hoc network has found applications especially to overcome the limitation of Bandwidth in wireless communication.

MANET (Mobile Ad hoc Network) is the routing problem, which is aggravated by frequent topology changes due to node movement, radio interference and network partitions. The proactive approaches attempts to maintain routing information for each node in the network at all times, whereas the reactive approaches only find new routes when required and other approaches make use of geographical location information for routing. The biological swarms like ants or honeybees often contain thousands of individuals. They perform extraordinarily complex tasks of global optimization and resource allocation using only local information.

Wireless Ad Hoc Networks research has been ongoing for decades. The history of wireless ad hoc networks can be traced back to the Defense Advanced Research Project Agency (DAPRPA) packet radio networks (PRNet), which evolved into the survivable adaptive radio networks (SURAD) program [1]. Ad hoc networks have play an important role in military applications and related research efforts, for example, the global mobile information systems (GloMo) program and the near-term digital radio (NTDR) program. Recent years have seen a new spate of industrial and commercial applications for wireless ad hoc networks, as viable communication equipment and portable computers become more compact and available. There are currently two variations of mobile wireless networks: infrastructured and infrastructure less networks. The infrastructured networks have fixed and wired gateways or the fixed Base-Stations which are connected to other Base-Stations through wires. Each node is within the range of a Base-Station. A “Hand-off” occurs as mobile host travels out of range of one Base-Station and into the range of another and thus, mobile host is able to continue communication seamlessly throughout the network. Example applications of this type include wireless local area networks and Mobile Phone. A mobile ad-hoc network (MANET) is a network formed without any central administration which consists of mobile nodes that use a wireless interface to send packet data. With current technology and the increasing popularity of notebook computers, interest in ad hoc networks has greatly peaked Future advances in technology will allow us to form small ad hoc networks on campuses, during conferences and even in our own homes. Each MANET node can serve as a router, and may move arbitrary and dynamically connected to form network depending on their positions and transmission range. The topology of the ad hoc network depends on the transmission power of the nodes and the location of the MNs, which may change with time.
SECTION II

2. Related Work

MA layer is responsible to coordinate the nodes access to the shared radio channel minimizing conflicts obtaining a high bandwidth efficiency is only possible exploiting channel to reuse opportunities utilization of the common radio channel has been the center of attention since the development stages of wireless communication. Dynamic channel is a network with a fixed a priori control channel assignment various game-theoretic approaches to the channel allocation problem in adhoc wireless networks model the channel allocation in multi-hop adhoc wireless networks as static cooperative game which players collaborative to achieve a high data rate. Multi-hop wireless networks CSMA techniques enable radio resources to be used in distinct locations increased bandwidth efficiencies at the cost of possible collisions due to the hidden terminal problem. Handshake reduces the hidden node problem is inefficient under heavy network loads due to the exposed terminal problem modification to the RTS/CTS mechanisms have been introduced the bandwidth efficiency including use of multiple channels. Using link layer multicasting broadcasting increases the efficient use of network resources, MANET applications such as military field communication use of broadcast services focus on link layer broadcasting and consider MANET scenario where the destination of the generated packet is not a specific node in the local neighborhood but all the nodes in the immediate of the transmitter. The IEEE 802.11 defines link layer broadcasting services for both infrastructure and ad hoc modes. Communication mode IEEE 802.11 MAC DCF specification disables the RTS/CTS mechanism as well as acknowledgements. MAC protocols assignment is performed by channel coordinates use the same channels with the channel reuse concept that regulates access through fixed infrastructure called base stations also forms the basis of the widely deployed GSM systems. The strategies for on-demand dynamic channel allocation used in cellular systems can be divided into two categories. Centralized and distributed schemes available channels are kept in a pool and distributed to various cells by a central coordinator, distributed dynamic channel allocation for cellular networks has also been studied extensively assigned a number of channels, can be exchanged among adjacent cells through message exchange mechanism between the channel regulators in an on demand basis. Load balancing within the context of heterogeneous networks of excess demand part of the network load can be offloaded to other networks using heterogeneous gateway nodes. AODV protocol to include distributed system to infer the network status and to optimize routes considering bandwidth stability, centralized load aware joint channel assignment routing is introduced. The MAC propose a location aware dynamic channel allocation scheme for MANETs their protocol mandates that location information be provided to each node, the capacity of the IEEE 802.15.4 protocol for linear and grid topologies and calculate the optimal channel assignment yielding the maximum possible channel reuse.

SECTION III

3. Problem Definition

Mobile Adhoc networks nodes exchange information items in a typical networks, data caching is a fully distributed scheme where each node upon receiving requested information determines the cache drop time of the information or which content to replace to make for newly arrived information. These decisions are made depending on the perceived presence of the content in the nodes proximity, whose estimation does not cause any additional overhead to the information sharing system. Consider both cases of nodes with large and small-sized caches. For large-sized caches, we devise a strategy where nodes, independent of each other, decide whether to cache some content and for how long. Protocols are suited for non-uniform load distributions as uncoordinated channel protocols our analysis designs the lightweight dynamic channel allocation mechanism and load balancing coordinated protocols that utilize these mechanisms to improve performance in terms of throughput energy consumption and inter packet delay variation.

Figure 1 is a model of Load Balancing Mobile Ad hoc Networks
3.1. MAC protocols: Dynamic lightweight channel allocation mechanism based on channel sensing algorithm, it is based on the single channel and collision. Nodes in the MANET are equipped with a transceiver that can operated in more than two nodes reception cannot meanwhile transmission or receive, receive node to detect the presence of carrier signal and measure its power even for messages that cannot be decoded into a valid packet, synchronously in the system neither of the packets can be received unless one of the transmissions capture the receiver, if the power level transmissions is significantly higher than the power level of all other transmissions and channel resources are managed and distributed by channel coordinators that are selected to perform the duty that can be specialized nodes in the network for their transmission needs by the channel coordinators. Operating the networks under these assumptions and incorporating a channel reuse scheme can archive higher bandwidth efficiency under uniform network loads.

3.2. Algorithm for Dynamic Channel Allocation: This algorithm is similar to the one exist in cellular systems under non-uniform loads crucial for the MAC protocol to be flexible enough to let additional bandwidth be allocated to the controllers in the loaded regions. Dynamic channel allocation system in cellular system depend on higher bandwidth back-link connections available cell towers, cell towers are back-lines connections in order to provide dynamic channel allocation and spatial reuse, MANET channel coordinators can only communicate by sharing common channel resources reducing the resources available for data transmission. Tight coordinators are highly dynamic would be costly for a MANET system we adopt a dynamic channel borrowing scheme that utilizes spectrum sensing. The channel controllers monitor the power level in all the available channels in the network and asses the availability of the channels by comparing the measured power levels with a threshold, the load on the channel controller increases beyond capacity provided that the measured power level is low enough the channel coordinator starts using an additional channel with the lowest power level measurement.

![Diagram of Structure of cluster Load Balancing Mobile ad-hoc Networks](image)

The channel coordinator starts using the channel transmission increases the power level measurement of that channel nearby controllers which in turn prevents accessing the same channel similarly local network load decreases controllers that do not need some channels to stop the transmissions in that channel making it available for other controllers.

3.3. Balancing Load: DCA algorithm is the approach of uniform load distribution from the channel coordinators of the other nodes in the network. Cooperative nodes smooth out mild non-uniformities in the load distribution without the need for the adjustments at the channel coordinator side. The load channel coordinators originate from the demands of the ordinary nodes in a network have access to more than one channel coordinator, the idea of cooperative load
balancing algorithm is the active nodes can continuously monitor the load channel coordinators and switch from heavily loaded coordinators to the one with available resources. Nodes can detect the depletion of the channels at the coordinator and shift their load to the other coordinators with more available resources vacated by the nodes that switch can be used for remaining nodes that do not have access to any other channel coordinators increased the total number of nodes that access the channel and hence increases the total number of nodes that access the channel and hence increases the service rate and the throughput.

SECTION IV

4.1. MH TRACE Protocol: certain nodes assume the roles of channel coordinators called cluster heads sends out to periodic beacon packets to announce their presence to the nodes in the neighborhood. Each node does not receive a beacon packet from any cluster head for a predefined amount of time, it assumes the role of a cluster head ensures the existence of at least one cluster head around every node in the network. MH TRACE time is divide into superframes of equal length as shown in above fig 2 frame is repeated in time and classified in time into frames provides channel across for the nodes in its communication range, each frame in the super frame is classified into sub-frames is used for signaling between nodes and the CH and data sub-frame is used to transmit the data payload slot is used for interference estimation for cluster heads operating in the same frame. Control sub-frame is used for signaling between nodes and cluster head and data sub-frame used to transmit the data payload beacon slot cluster head announce existence for cluster heads and number of available data slots in the current frame is used for interference estimation for cluster head operating in the same frame. During cluster head slot transmit a message with a given probability and listen to the medium to calculate interference caused by other cluster heads operating in the same frame monitoring the interference levels beacon slot of each frame.

4.2. Load Balancing for MH TRACE: DCA-TRACE tackles non-uniform load distribution by allowing the cluster heads to access more than one frame in the super frame can be tackled from nodes perspective. Majority of nodes in a TRACE network in the vicinity of more than one cluster head are in the vicinity of two or three probabilities of 52% nodes that are in vicinity of more than one cluster head can ask for channel access from any of these cluster heads using cooperative approach and a clever cluster selection algorithm on the nodes load can be migrated from heavily loaded cluster head to the cluster head with more available resources. TRACE protocol contend for channel access from one of the cluster head that have available data slots around themselves after successful contention they do not monitor the available data slots may become heavily loaded during data stream. To tackle nodes should consider the load of the cluster head not only first contending for channel access but also after securing a reserved data slot during the entire duration of their data stream. Nodes A-G are source nodes and need to contend for data slots from one of the cluster heads. Cluster head has six available data slots from one of the cluster head data slots, MH TRACE contentions go through in alphabetical order node G would mark cluster head as full and would ask for channel access from cluster head 2 if node G secures a data slot from cluster head before any of the nodes A-F one of the sources nodes would not be able to access to the channel. DCA TRACE cluster head allocates all of its available slots triggers the algorithm to select an additional frame accessing one additional frame might not always be possible if the interference levels on all other frame are too high.

SECTION V

5. Comparative Study

A distributed dynamic channel allocation algorithm with no optimality guarantees for a network with a fixed a priori control channel assignment, various game theoretic approaches to the channel allocation problem in ad-hoc wireless networks. Multichannel model channel allocation problem in multi-hop ad-hoc wireless networks as a static cooperative game in which some players collaborate to achieve a high data rate, multi-hop wireless networks CSMA techniques enable the same radio resources to be used in distinct locations leading to increased bandwidth efficiencies at the cost of possible collisions due to the hidden terminal problem. Different channel reservation techniques are used to tackle the hidden terminal problem use an RTS/CTS packet exchange mechanism before the transmission of the data packet. 802.11 distributed coordination function uses a similar mechanism approaches are not scalable and cover group communication. Compare to existing analysis non-uniform load distribution in MANETS into an energy efficient real-time coordinated MAC protocol named MH-TRACE channel access is regulated by dynamically selected cluster heads. MH-TRACE has been shown to have higher throughput and to be more energy efficient compared to CSMA type protocols, MH-TRACE incorporated spatial reuse it does not provide any channel borrowing or load balancing mechanisms and thus does not provide optimal support to non-uniform loads which increase the throughput uses scalable approach and reduce energy consumption.
SECTION VI

6. CONCLUSION

Our analysis presents the non-uniform load distribution in adhoc networks a light weight dynamic channel allocation balancing algorithm, dynamic channel allocation works through carrier sensing does not increase the overhead effective in increasing the service levels as throughput in the system with minimal effect on energy consumption and packet delay variation. Compare to dynamic channel allocation our algorithms simultaneously maximizing the improvements in the system alone and performs better for many scenarios, MH TRACE combines channel allocation cooperative load balancing algorithm into the TRACE framework. Many challenges in implementation of protocols interference from devices out of the system limited memory and computing capabilities of the hardware are challenges to be tackled and test the feasibility of the CDC TRACE protocol on Microsoft SORA defined radio systems communication on beacon contention and packets.

Reference

[1] Institute of Electrical and Electronics Engineers, “IEEE Std 802.15.4-2006,” Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (WPANs), September 2006.


