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AN HYBRID ROUTING PROTOCOL FOR EFFICIENT POWER MANAGEMENT AND CONTROL IN MANET

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ABSTRACT

As nodes in MANET are predominantly battery driven depletion ofenergy is a critical concern and to address the issues related to increasing the throughput, efficiency, energy consumption and to reduce the network loadwe propose a concept to combining power aware routing and channel allocation strategy that solemnly address these concerns. The utilization of the resources such as bandwidth and energy depends on a number of conditions such as network size, node density, and load distribution. These conditions are uncontrollable and often vary throughout the operation of the network. The scope of the work is to bring out the commonalities present separately in channel allocation and power aware routing by joint optimization dynamic channel allocation mechanisms and routing possibilities.

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KEY WORDS

Manet, Routing, Channel allpcation, Residual Power.CrossLayer Optimization

INTRODUCTION

AN AD-HOC network is an on demand network which is deployed base on resources available at the particular time. This network has various concerns regarding to the deployment, routing, power management, channel allocation, channel control etc. These are issues which are either addressed partially or relatively in logical manner to increase the overall efficiency and throughput of the deployed network. To manage these resources efficiently there are various methods used in order to negate the issues to a particular extent when these methods are coordinated we can annihilate problems which affects the network to a greater extent. In this paper we propose a concept of combining the routing and channel allocation approach to create an energy efficient load balancing network. The major contention related to channel allocation is decisive

Handling of bandwidth in the event of non-uniform loads. To support uneven or non-uniform loads maximization of spatial reuse and multicasting is enabled at the link layer, that facilitate the use of resources in tangible manner. This annihilates the need for several transmissions of similar loads. In MANET the aware of power heterogeneity is an important technical challenging problem to increase the energy efficiency of each node. The mobile nodes in MANET have different transmission power and power heterogeneity.

Efficient Energy Routing Protocols such as EPAR (Efficient Power Aware Routing protocol) mainly considers the node capacity by its remaining battery power and the expected energy spent for forwarding data packets reliably.EPAR uses mini-max formulation method for the selection of the route that has maximum packet delivery ratio at the smallest Residual Battery Power.

The transmission of information across the network occurs as relaying of data packets from one node to other node within the network. Due to the mobility of node, topology in the network can change dynamically and nodes can be added and removed at any time in the network. To perform proficient handling of resources in network we use dynamic channel allocation algorithm coalesced with routing algorithm to bring out a hybrid scenario called optimized DCA for efficient power management and channel control in the network.

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RELATED WORK

The existing work done in the in addressing issues related to our work is as follows According to Bora Karaoglu and Wendi Heinzelman (2015) a lightweight dynamic channel allocation mechanism and a cooperative load balancing strategy that are applicable to cluster based MANETs can be used to address the issues in channel allocation. They present protocols that utilize these mechanisms to improve performance in terms throughput, energy consumption and inter-packet delay variation (IPDV). Through extensive they showed that both dynamic channel allocation and cooperative load balancing improve the bandwidth efficiency under non-uniform load distributions compared to protocols that do not use these mechanisms as well as compared to the IEEE 802.15.4 protocol with GTS mechanism and the IEEE 802.11 uncoordinated protocol.

According Angel Lozano (2012) DCA algorithms, some important issues have been neglected because of the complexity involved in their study. In particular, the impact of user motion on the performance of DCA systems has not received enough attention. He quantify the impact of motion on the capacity and cost in terms of average number of reassignments per call of a variety of representative distributed fixed-power DCA algorithms. A novel adaptive algorithm especially suited for mobility environments is proposed, which achieves high capacity while controlling the reassignment rate. He also proved that most of this capacity can be effectively realized with a reduced number of radio transceivers per base station.

According to Kunal Gaurav and Mani Upadhay (2014). In MANET each and every process consumes power. Power consumption is one of the most crucial design concerns in Mobile Ad-hoc networks as the nodes in MANET are battery limited. To increase the life time of nodes as well as network energy management is necessary. The life time of a node can be increased when less power is consumed by the nodes during active as well as during inactive communication. In order to increase the life time of a node, traffic should be routed in a way that, power consumption is minimized. DSR is a routing protocol used in MANET. They used two mechanisms in routing Route Discovery and Route Maintenance. During route discovery it selects the path to establish communication between source and destination. The flooding ofroutes creates overhead in routing traffic whichcause extra consumption of energy. They developed new route discovery mechanism is proposed to conserve the energy of nodes during route discovery and data transmission phase compare to original DSR protocol.

DYNAMIC CHANNEL ALLOCATION ALGORITHM

The first mechanism that we propose is a dynamic channel allocation (DCA) algorithm analogous to the ones that exist in cellular systems. Under uneven and non-uniform loads, it is essential for the MAC protocol to be flexible enough to let the vacant and unused bandwidth to be allocated to the controllers in the heavily loadedregions.

The working of algorithm does channel allocation on behalf of mobile hosts in the cell. Each and every request is marked and time stamped and sent to nearest service stations to be assigned for communication session. The nature of the algorithm is finite and due to non-deterministic propagation, channel interference occurs to avoid this interference multiple service station approval is deployed in this algorithm. As the channel allocation varies with time, the algorithm uses temporal and spatial changes to control the varying load distribution the channel due to the highly dynamic and changing behavior of the network we adopt a dynamic channel borrowing scheme that employ spectrum sensing.

In this algorithm, the channel controllers invariably look out the power level in all the available channels in the network and assess the availability of the channels by correlate the measured power levels with a threshold. If local load surgebeyond certain local capacity if the measured power level is minimum, the channel coordinator commences using the channel with the lowest power remains. Once the channel coordinator starts using the channel, its transmission increases the power level measurement of that channel for close by controllers, which in turn blocks them from securing the same channel. If the local network load decreases, controllers that do not need some channels and block the transmissions in that channel, making it reachablefor other controllers. Channel coordinators react to the increasing local network load by increasing their share of bandwidth. Although being proficient in lending support for non-uniform network loads, the proactive response taken by the channel coordinators increases the interference in the entire system.

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The DCA algorithm approaches the problem of non-uniform load distribution from the perspective of the channel coordinators. The same problem can also be approached from the perspective of ordinary nodes in the network. This cooperative behavior smooth's out mild non-uniformities in the load distribution without the need for the adjustments at the channel coordinator side.

The load on the channel coordinators arise from the insistence of the ordinary nodes. Many nodes in a network have access to more than one channel coordinator. The underlying idea of the dynamic channel allocation algorithm algorithm is that the active nodes can continuously monitor the channel usage and switch from heavily loaded coordinators to the ones with available resources. These nodes can reveal that the channels available at the channel coordinator are drained and shift their load to the channel coordinators with more available resources. The resources departed by the nodes that switch can be used for other nodes that do not have admittance to any other channel coordinators. This increases the total number of nodes that access the channel and hence increases the throughput.

POWER AWAREALGORITHM

The algorithm is deployedon networks in which power is a restricted resource. Only a bounded number of messages can be disseminated between any two hosts. This issue is solved by routing messages so as to augment the battery lives of the hosts in the system. The course of a network with respect to a sequence of messages is the earliest time when a message cannot be sent because of saturated nodes. This metric under the assumption considers that all messages are important. However it can be relaxed to accommodate up to message delivery failures.

Several metrics can be used to enhance power routing for a sequence of messages. Minimizing the energy consumed for each message is an evident solution that revises locally consumed power. Other useful metrics include lessen the variance in each node power level, lessen the ratio of cost/packet, and minimizing the maximum node cost. A drawback of these metrics is that they focus on individual nodes in the system instead of the system as a whole. Therefore, routing messages in accord to these metrics might promptly lead to a system in which nodes have high unconsumed power but the system is not connected because some critical nodes have been depleted of power. The prime focus is on global metric by maximizing the lifetime of the network. This metric is very useful for on demand networks in which each message is decisive and the networks are sparsely deployed.

This problem does not have a constant competitive ratio to the offline optimal algorithm that knows the message sequence. It is an approximation algorithm for power aware message routing that enhances the lifetime of the network and examines its limits. This algorithm combines the benefits of enumerating the path with the minimum power consumption and the path that maximizes the minimal enduring power in the nodes of the network. The power aware algorithm algorithm has a good competitive ratio in practice, approaching the performance of the optimal off-line routing algorithm under realistic conditions.

HYBRID ROUTING CHANNEL ALLOCATION ALGORITHM

OPTIMIZED DCA

- Begin
- Initial Power = 0
- Compute $Power/\Delta P_t$ for every host
- Calculate the minimal $Power/\Delta P_t$ among all nodes
- if some host is sopped then
- exitRequest the measurement of TX power Powermin, of user I in the time slot k of cell Cj
- IfPowerciu>Powercmaxu
- for l = 1: max(Neihboring_cells)
- forn = 1 : max(TS_in_use) where n belongs set of used TS's
- ifTScln == RX time slot
- determine interference from nodes:

- Ibln = (Powerclu)n (MBcl,cj)n
- else
- determine interference from BS:
- Ibln = (Powerclu)n (BBcl,cj)n
- end if
- if $[((\text{Ibln}<Ib_l^k)\&(\text{direction}(TS_l^n)\neq\text{direction}(TS_l^k))]$
- exchange TSn for TS k in cell l
- end if
- end for
- end for
- else
- Assign channel
- end if
- END

An important factor in the optimized DCA algorithm is the parameter power that evaluates the initial power level in transmitting nodes it works based on the consumed power used in transmitting the messages measures the tradeoff between the max– min path and the minimal power path. It calculates power for collection of messages that has to transmit without being any interference appearance such that will lead to a longer lifetime for the network than each of the max – min and minimal power algorithms.

The algorithm starts when the mobile is requested to transmit with higher power than the maximum power permitted, i.e. the state at which outage or service degradation would occur. The algorithm steps in assuming that a MS uses at least two TS's for the communication to the BS. It monitors the interference in all n TS's of all neighboring cells. Two cases can then be distinguished:

If TS in cell l is used for RX (from the BS point of view) the interference from this particular neighboring TS is caused entirely from its MS's since α = 0 and ideal integration is assumed. Furthermore, it is assumed that the MS's in the neighboring cell are able to determine the path loss to their neighboring BS's. This may be adopted by a fixed transmission power on the pilot channel. The MS's report their transmission power and path loss measurements to the BS which makes it available to the other cannel. Hence, the information about the path gain matrix of the mobiles in cell to the BS in cell l, Pcl, is assumed to be available to the optimized DCA algorithm.

If TS n at the BS is used for transmission the interference contribution from cell deals only from the BS (same entityinterference as α = 1).The transmission powers at the BS's are known and can easily be expressed to the channel and so can the path loss to the neighboring BS's, $BB_{cl,cj}$.

A check is made to examine if there is one TS in the neighboring cell which would cause less interference than the current TS k. If this is true and TS n is used for RX while TS k was used for TX, or vice versa, then the neighboring cell, cl, interchanges TS n with TS k. These results in TS opposing time slots with respect to the Cj. The algorithm is used by inferring the power level from the nodes by enumerating residual power level from the nodes. Thususing this inferred value to efficiently allocate channel resources.

RESULTS

This section will use the NS2 network simulator to evaluate the optimized DCA algorithm. Simulation of all nodes in the stationary distribution in the 1000 * 1000m2 two-dimensional plane, grid is divided into regular network topology and random distribution. Data transmission channel distance of each node is 250m, the distance of 500m interference. Control channel transmission distance is two times the data channel. Each of the channel capacity of 2Mbps, each node has 5 interface, at network initialization, an interface distribution control channel, the other interface randomly assigned data channel. There are 11 channel systems, of which one is a common channel. With the RTS/CTS IEEE in the MAC layer of 802.11 DCF collision avoidance mechanism. In a grid like uniform arrangement of the 5*5 node in the regular network, in the scene 30 nodes randomly distributed random distribution, node arrangement will no longer move. In event of measure the performance of routing scheme proposed in this paper, firstly selected by multi-channel multi interface wireless networks are commonly used inrouting strategy as a comparison object, only considered without considering the inter stream interference flow; choose another interference aware in experiment was performed multiple analog averaging as criterion, in the network initialization data channel randomly distributed over the nodes on the interface when the interface assignment, channel no neighbors same distribution channel is to re select the channel assignment. Throughput in different network environment .The system throughput increases when flow number of access network increases. It is also easy to see that our proposed has higher throughput in both two environments. This main reason is optimized DCA adopt the adaptive switch method to achieve the success transferring, and considers disturbing of in-flow and out-flow, so the performance is lower. In **[Figure -1]**, the results of these algorithms are presented, It is visible that optimized DCA algorithm has better channel efficiency and throughput and has a better power utilization factor.

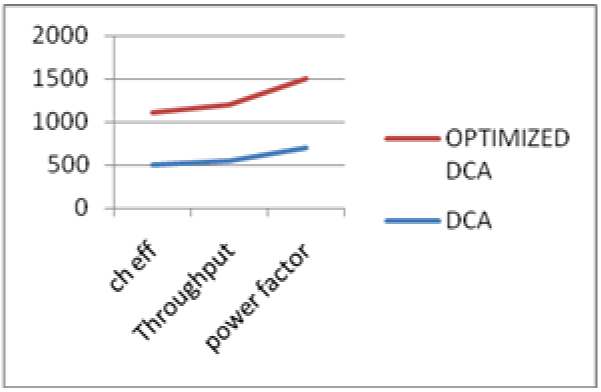

Fig: 1. Comparison of optimized DCA and DCA

CONCLUSION

We proposed an optimized DCA routing algorithm protocol that merges the functionalities of dynamic channel allocation and power aware routing thus enables the new frame work more efficient in terms of throughput, bandwidth utilization consumption factor. It also enumerates the use of more efficient means of routing and channel allocation mechanisms that will enhance the performance of the ad-hoc networks. The future enhancements that can be included are multi-hop extensions, handover issues, overhead issues and multicasting probabilities.

CONFLICT OF INTEREST

The authors declare no conflict of interests.

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FINANCIAL DISCLOSURE

The authors report no financial interests or potential conflicts of interest.

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