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Efficient Channel Allocation and Congestion Control Technique for Wireless Adhoc Networks

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Abstract

Internet is widely used in the fast growing world. So the wired and wireless networks are mainly used in an active area and there are many limitations in the wireless mesh network. The Congestion Control in the Network field is by means of Scheduling packets from different traffic flows for processing at a specific node is done. In Wireless Adhoc Network, a channel assignment has to balance the connectivity and aggregate bandwidth. In order to increase the maintaince, we use channel assignment algorithm. This algorithm is used to assign the channels to the network interfaces from the given expected load on each virtual link. In the existing work , there is no combined solution of multi-channel assignment with routing and congestion control. In this paper, we propose an efficient multi channel allocation and congestion control technique for wireless mesh networks. The frequency channels are assigned according to the congestion measure which indicates the congestion status at each link. Depending on the selected congestion measure i.e. queuing delay, packet loss probability and differential backlog and various design objectives can be achieved. Our proposed algorithm is simple to implement as it requires each node to perform a local search. Unlike most of the previous channel assignment schemes, our proposed algorithm assigns not only the non-overlapped frequency channels but also the partially-overlapped channels. This technique uses traffic aware metic to provide quality of service and it comprises requirements on all the aspects of connection such as service response time, loss, signal-to-noise ratio, cross-talk, echo, interrupts, frequency response, loudness levels and so on. To overcome this problem, we use proposed technique which can improve throughput and channel utilization to very high extent because it provides solution for multi-channel assignment and congestion control. And also assigns the channels so that congestion is avoided and co-channel interference levels with same channel are reduced. In this paper, we evaluate high throughput and channel utilization along with reduced latency which can be implemented in the Adhoc Network. Thus the efficient channel allocation with congestion control technique for Wireless Mesh Network can be done using NS-2 Simulation tool for attaining high throughput and reduced latency. Thus the paper proposes an efficient channel allocation for Congestion Control in Adhoc Network.

Keywords: Wireless Mesh Network, channel assignment algorithm, multi-channel assignment, routing, congestion control.

Introduction

A Wireless Mesh Network (WMN) is a communication network made up of radio nodes organized in a mesh topology. Wireless mesh networks often consist of mesh clients, mesh routers and gateways. The mesh clients are often laptops, cell phones and other wireless devices while the mesh routers forward traffic to and from the gateways which may, but need not connect to the Internet. The coverage area of the radio nodes working as a single network is sometimes called a mesh cloud. Access to this mesh cloud is dependent on the radio nodes working in harmony with each other to create a radio network. A mesh network is reliable and offers redundancy. When one node can no longer operate, the rest of the nodes can still communicate with each other, directly or through one or more intermediate nodes. The figure below illustrates how wireless mesh networks can self form and self heal. Wireless mesh networks can be implemented with various wireless technology including cellular technologies or combinations of more than one type. A wireless mesh network can be seen as a special type of wireless ad-hoc networks. A wireless mesh network often has a more planned configuration and may be deployed to provide dynamic and cost effective connectivity over a certain geographic area. An ad-hoc network, on the other hand is formed ad-hoc when wireless devices come within communication range of each other. The mesh routers may be mobile and be moved according to specific demands arising

in the network. Often the mesh routers are not limited in terms of resources compared to other nodes in the network and thus can be exploited to perform more resource intensive functions. In this way the wireless mesh network differs from an ad-hoc network, since these nodes are often constrained by resources.

Literature Survey

Bandwidth Efficient Admission Control

A bandwidth-efficient admission control mechanism addresses the two main issues of industrial communication, reliability, which is affected by behavior of such networks, and timeliness, which depends on the transmission scheduling policy adopted [1], in real time approach the minimum amount of message need to be delivered on time retransmissions for the wireless links is mainly considered. In networks all the nodes will be having common physical channel, even when there is less collision error rate on the packet is different. The message errors and retransmissions are mainly based on flow and size of packets. The special admission control test is combined. The communication period is not derived from the success rate of communication the startup, The EDF is a framework where reliability and timeliness is adopted. So in this paper efficient use of bandwidth is analyzed.

TS/TDMA Energy Efficient Congestion Control

Congestion and limited energy causes delay in network, saving the battery life, time allocation, delay, are the some aspects that need to be considered, in this approach statistical time division is combined with the TDMA to avoid congestion and saves energy as discussed in the paper [2] (TAL) is used so that it manipulates the free time slots that occurs due to the node mobility (LBA) is also used in order to allocate the load of the packets properly. The details of the node location, battery and memory are obtained initially. When there is no packets to be send free time slots are allocated to the nodes or when same data occurs it is not suppose to send the data. When data needs to be send a new time slot is assigned to the node it can also choose the path which is already established so this will save the time and energy of the network.

New Tcp-Reno on wireless packet loss rate

In the work of Tcp-Reno it is based on monitoring the wireless packet loss rate in real time along with the router configured with explicit congestion notification mechanism. In which it is capable of distinguishing the loss whether it is because of mobility or congestion packet loss. So the sender takes advantage to adjust the segment size. In the paper [4] the ECN configured at the router that marks the packets when the router's buffer occupancy exceeds a threshold. Explicit Congestion Notification (ECN) is an extension of RED. The router configured with the function of ECN can indicate incipient congestion where the notification can sometimes be through marking packets rather than dropping them the TCP sender to effectively differentiate packet losses due to random wireless link errors from those caused by link congestion.

Fast congestion notification

The TCP application depends upon the queue management mechanism. Fast congestion notification also controls the packet admission and the congestion control this helps to send congestion avoidance as early as possible even if the queue is almost full or empty the arrival rate is manageable so in this paper [5] it examines the properties by fixed values in queue level and it shows that larger the drain (growth) in the queue, the smaller (larger) is the largest average arrival rate that can be endured before activating the packet drop/mark mechanism, and the larger (smaller) the maximum achievable drop probability.

Queue management manages by dropping packets when necessary in which the packet admission to the queue is done during the mark activation. The drop mechanism is of 2 categories reactive and proactive. In reactive it doesn't prevent the packet drop before the buffer is flooded and in proactive it prevents the packet drop before the buffer gets full. Drop-tail is the reactive queue management method so it has the global synchronization problem. But in active queue management the global synchronization is eliminated which in turn increases the throughput. The fast congestion notification responds to congestion very quickly.

In the work of fast congestion notification it is done before the buffer overflows by considering the instantaneous queue length rather than optimal queue length. In this mechanism if the packet is dropped, congestion avoidance notification is given to the gateway so it considers the buffer capacity and reduces the packet loss rate. So it mainly considers the traffic rate and avoids congestion.

Receiver-Assisted Congestion Control

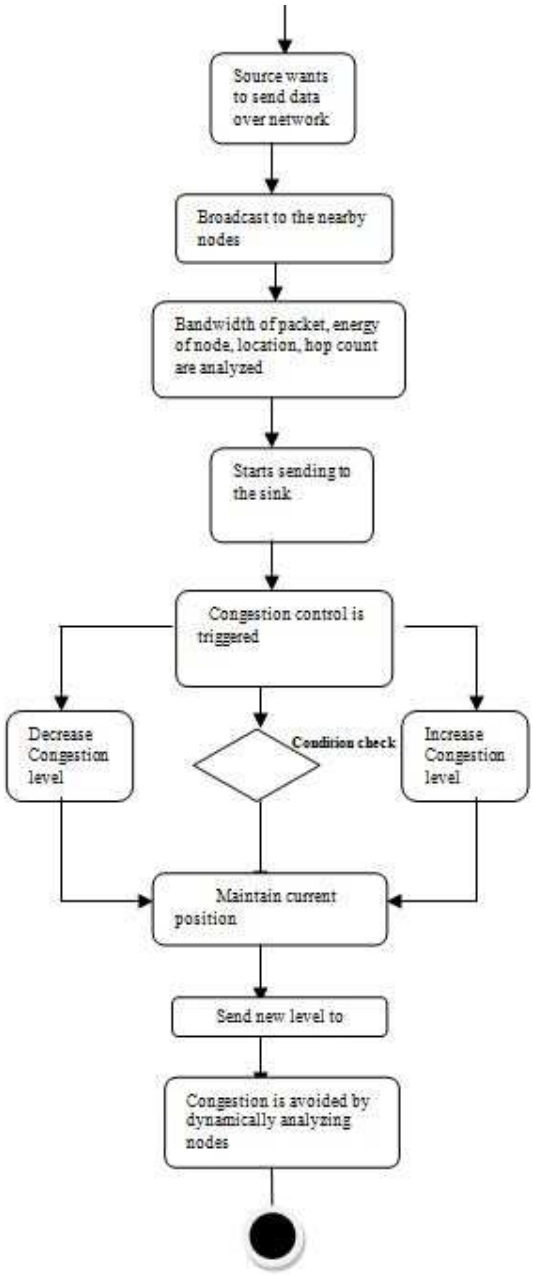
In many applications the fast data transfer is essential but the TCP cannot effectively utilize the network capacity. In TCP when the node continuously receives three negative acknowledgements it considers there is a packet loss and resends the packet but it can be because of mobility also which leads to poor performance. And on retransmission the send need to wait and calculate the window size to transmit the data so it greatly reduces the throughput. In the paper [6] RACC the receiver does the flow control in which the receiver

has the timer set if the timeout happens then it considers it as packet loss and informs the source to retransmit the lost packet. But it can be because of network collision also. So, in our work we are going to consider and differentiate both rectify the problem accordingly.

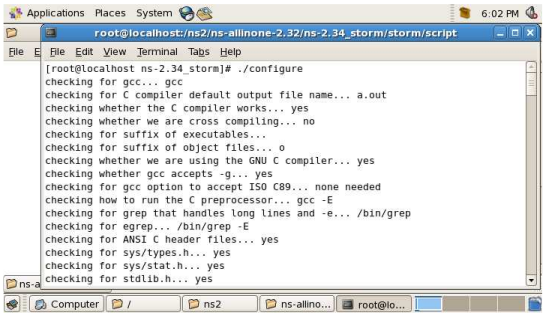
Congestion and Peak Power Control

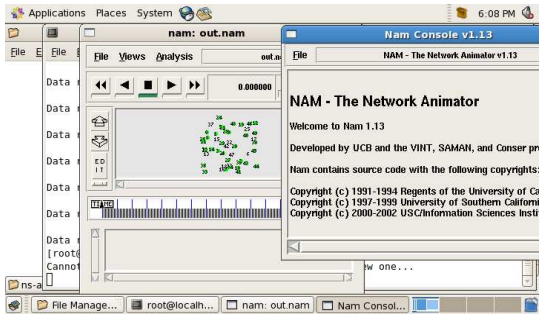
As given in the paper [7] the admission of the packets to the network, power control, and congestion are the main aspects of the paper. The admission control is done in order to maintain the packet delivery ratio to be high. So control algorithms are introduced in order to maintain the QoS of the system the host channel adapters (HCA) and network interface cards (NIC) are used to find the effectiveness of the system. The admission and congestion control is done by probing method on getting the request the router compares the available bandwidth with the bandwidth of the packet that is going to be sent. If it is accepted then the destination node is checked whether the packet is send to proper destination or not. Thus by this method it initially checks the bandwidth available and then send the packet so we are adapting this mechanism in our system. Cross layer hop by hop congestion control scheme [9] is proposed to improve TCP performance in multi hop wireless networks which coordinates the congestion response across the transport, network, and transport layer protocols. The method determines the main reason of the packet loss and coordinates the layers of Mac layer, transport and network layer. The congestion control mechanism is done when the alternate route is also chosen in order to avoid the congestion in future.

Architecture



Results and Discussion

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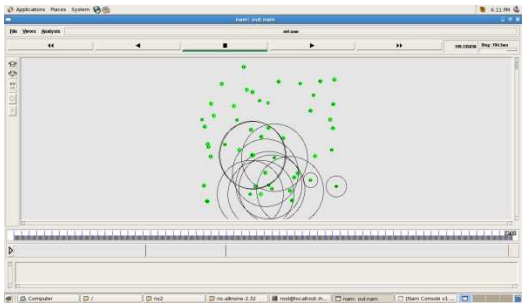

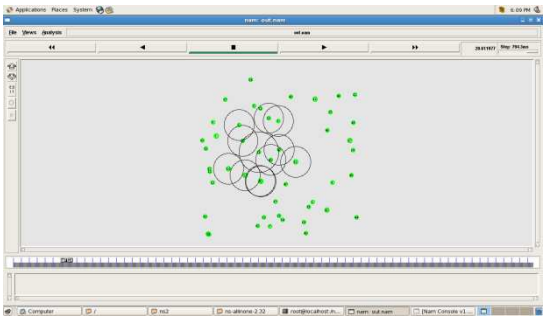

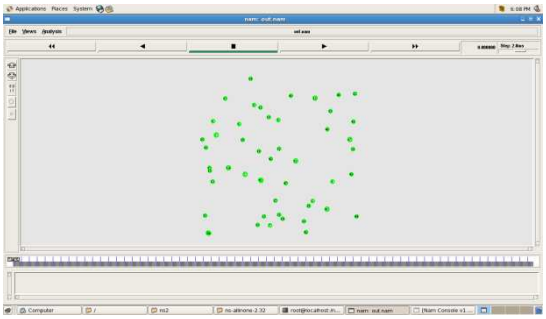

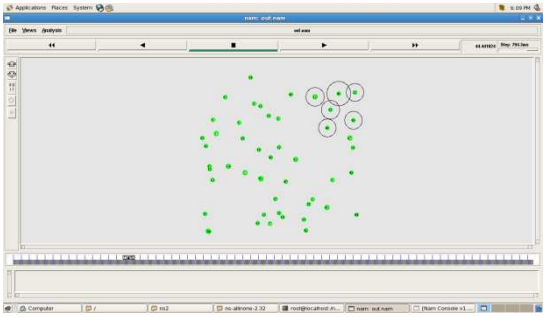

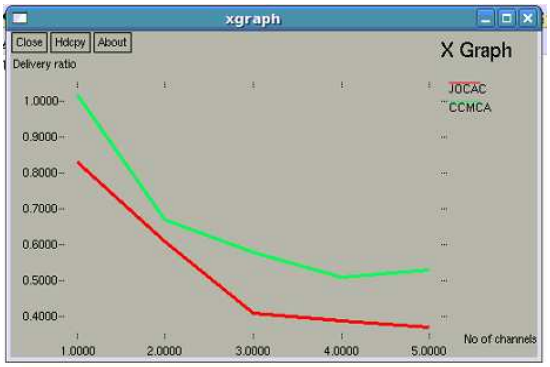
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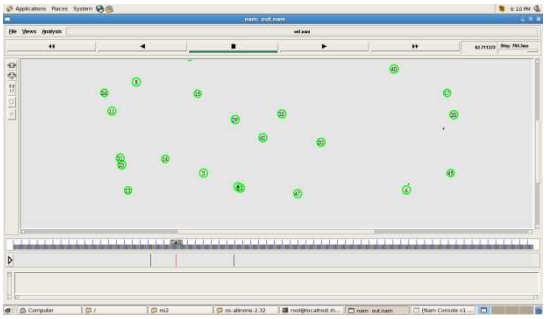

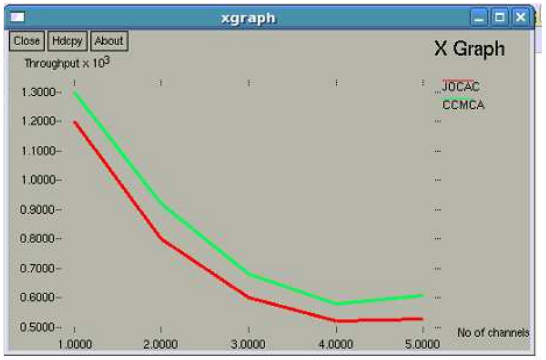
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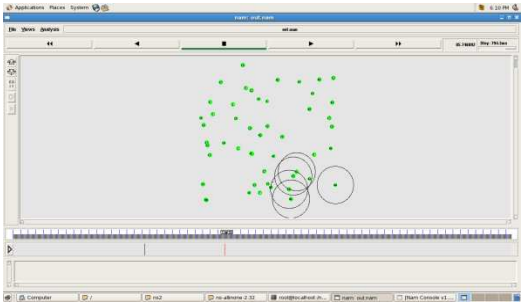

Conclusion

In this paper, we have proposed an efficient multi channel allocation and congestion control technique for wireless mesh networks. It uses traffic aware metric in this technique in order to provide quality of service. Our proposed technique improves the throughput and channel utilization to very high extent since it provides solution for multi-channel assignment and congestion control. Our proposed technique assigns the channels such that congestion is avoided and co-channel interference levels among links with same channel are reduced.

In the existing work done so far, we observe that, no work is done on the combined solution of multi- channel assignment with routing protocol and congestion control. Also the use of a traffic aware metric can be investigated which could optimize the capacity of the network. Thus the efficient channel allocation and congestion control technique for wireless mesh network has been implemented in NS2.

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