1.1. INTRODUCTION.

The networks are classified [67] as follows.

1. Wired networks. In Wired networks, all the nodes are connected point-to-point using a wired medium. Physical devices like Switches and Hubs are used to connect the nodes to increase the strength of the connection. These networks are efficient, less expensive and faster than wireless networks. The chances of getting disconnected are very less. A wired network offer connection speeds of 100 Mbps to 1000 Mbps.

2. Wireless Networks. A cable cannot be layed in all the places like hill region, across the rivers, mountains, through the fire etc. In Wireless networks, all the nodes are connected using a wireless medium. No physical medium like physical wires/cables are used to establish the connection between the nodes. The users can access the remote real-time information.

1.1. WIRELESS NETWORKS

There are two types of wireless networks [62].

1. Infrastructureless Networks. 2. Infrastructure Based Networks.
A mobile ad hoc network (MANET)[62][9] is a group of autonomous mobile wireless nodes without a fixed infrastructure. New members can join and leave the network at any time.

Due to this mobility nature of the Mobile Adhoc networks, the nodes state information changes frequently and finding a channel schedule for the nodes in the network becomes difficult.

The channel bandwidth and battery lifetime are the two resources to be optimized to improve the performance of the Mobile Adhoc Networks and it is important to study the effect of different transmission power levels on the performance of the mobile adhoc networks.

Hence we proposed methods for

1. Finding an efficient schedule which is adaptive to the changes in the topology.

2. Maximizing the throughput.

3. Maximizing the network capacity.

4. Avoiding collisions.

5. Minimizing the information to be exchanged between the nodes.

The performance of a mobile adhoc networks depends on the parameters like frame sizes, slot duration, channel capacity, channel utilization (i.e., the fraction of channel capacity used for generating good throughput), and the number of concurrent transmissions, transmission range, distance between the nodes, density, SINR, and data rates allowed for transmission in the network.
The Medium Access Control (MAC) protocol contains a set of rules to decide how a collection of nodes can share the common medium, achieve reliable data transmission, obtain maximum channel utilization, and provide fair access to the medium.

1.2. MAC PROTOCOLS.

Generally, MAC protocols are classified as follows.

1. Contention-based. There are two categories of contention based protocols. They are random access [63] and collision resolution [63] protocols. ALOHA and CSMA which are used in IEEE 802.11 are contention based protocols.

2. Contention free-based. In this approach [63], the channel is generally organized in frames, where each frame contains a finite number of time slots. The total transmission period contains a reservation period and a transmission period. The reservation period consists of fixed length slots. During the reservation period, the nodes that are willing to transmit, reserve a time slot in the frame. At the end of the reservation period, all the nodes transmit according to their reservations in the transmission period. TDMA, FDMA, CDMA are some of the reservation protocols. STDMA is a reservation protocol, which allows two or more non-interfering nodes to share a slot in a frame. It improves the spatial reuseness of the channel.

1.3. CONTRIBUTIONS.

We assumed that the network is densely populated and wireless nodes are independently distributed.

In this report
1. We proposed an interceptor between MAC layer and PHY layer called ACSP which implements the following

   a. NABS, for broadcast schedule computation.

   b. Calculate optimal transmission power and data rates at the transmitter.

   c. Monitor the topology changes and maintain them through various event handlers and control packets.

2. The proposed time_slot_assignment protocols are simple, and adaptive to the changes like joining / leaving the network.

3. A multi source sink multi stage physical radio propagation and interference graph model with SINR computations is used to represent the mobile adhoc network and new interferences called type 3 interferences are introduced between the nodes. The problem of finding maximum concurrent node transmissions is viewed as a dynamic programming problem. The proposed NINTMAXTR tree is constructed and applying backward approach, we computed the maximum concurrent node transmissions in each slot.

4. The main aim is to obtain a Minimum length frame with maximum node transmissions. NABS is free of collisions. NABS performs better than the earlier studies on channel allocation for maximization of channel utilization like conventional TDMA, Chalmatac’s schedule [58], Ju’s Schedule [33], Oikonomou’s schedule [59], TTR schedule [56] and 802.11 [60] etc.

In [68] an efficient algorithm to find broadcast scheduling in Adhoc TDMA networks is given. The authors claimed that their method is efficient than the methods suggested in [29][69][70][71][72]. It was proved that the proposed methods yields better results than the method suggested in [68].
5. The power and rate adaption algorithm is used to allow a node to tune itself to an appropriate data rate, depending on the perceived SINR.

6. The hidden node problem is handled efficiently in NABS. NABS implements the earlier type 1, type 2 and proposed type 3 interferences effectively.

7. The current study is carried out by observing the channel behavior for various parameters. Results proved that our proposed work yields higher network capacity. Minimum information is exchanged between the nodes. The other parameters like hop-degree, frame length, throughput, distance between the 1-hop nodes, the interference range, communication range and propagation range are studied to yield maximum throughput and network capacity.

8. The proposed algorithms for computing the schedules, throughput are discussed and tested to achieve all the desired results.

1.4. OUTLINE OF THE THESIS.

The thesis is organized as follows. In chapter one, the general introduction to the scheduling problem is specified, the various types of networks, introduction to MAC protocols and the contributions are also discussed.

In chapter two, the related work is discussed. The TDMA [67] and STDMA [67] scheduling methods are discussed. We also discussed the differences between centralized and distributed scheduling methods. There are two methods for broadcast scheduling: Centralized and Distributed. There are two methods for distributed broadcast scheduling: Adaptive and non-adaptive. Chapter two describes the distributed method for adaptive broadcast scheduling. In chapter two, the radio
propagation and interference network model is also discussed. The formulas for throughput, SINR, minimum transmission power, maximum data rates [26][30][31] are also studied. The channel assignment problem for mobile adhoc networks is discussed.

In chapter three the proposed Max_trans physical radio propagation and interference graph model with SINR computations is discussed. The throughput maximization is viewed as a dynamic programming problem and applying a backward approach, the maximum throughput is computed. Generally the channel assignment problem for mobile adhoc networks considers the various parameters like no central control, limited control information and adaptative to the topological changes. The design of the proposed NABS is discussed. The procedures maximize_schedule () which is used to maximize the total number of transmissions with minimum the frame length is discussed.

It was proved that NABS works efficiently than the earlier methods for channel assignment in mobile adhoc networks. The algorithm is tested on various example networks with different network topologies. A power control method is also studied. The method for computing network capacity is also studied.

In chapter four, the design of the ACSP interceptor is discussed. The time slot allocation and reservation protocols are proposed. Each joining node had to undergo the process of conflict_resolve and time_slot_allocation. The procedures for conflict_resolve and time_slot_allocation are developed in this chapter. The new broadcast schedule is constructed in such a way that it is consistent with the existing topology. Similarly the procedure for leaving node processing is also designed here. The design of an ACSP interceptor, event handlers and control packets are also discussed in this chapter. The ACSP Design for the rate-adaptive to the existing network topology is also discussed here.
Chapter five we studied the impact of the parameters that effect the network performance like Frame length, Joining/leaving node processing, network capacity as a function of Transmission powers / SINR / transmission range thresholds, data rates, and maximum throughput are studied. The simulation results are presented in this chapter. The NABS is simulated over a network consisting of 14, 50, 100, 150, 200, 250 nodes and at different degrees like d=2,4,6,8,10,12,14,16,18,20,etc.

We also compared the results of the proposed work with the existing methods. The spatial reuse, data rates, network capacity, transmission powers obtained are compared with earlier study and the advantages of the proposed work over the existing algorithms is also discussed here.

Chapter six presents the conclusions and future work.

1.5. CONCLUSION

Hence in this chapter we introduced the concept of wireless networks, Mobile Adhoc networks and MAC protocols. Our contributions and flow of the thesis is also explained.
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