Distributed Channel Assignment in 802.11: A Survey

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ABSTRACT
In recent years, we have noticed a huge interest in the study of channel allocation in 802.11 wireless networks. For two 802.11 based interfaces to correspond with one another, they have to be allocated to a typical channel. Wireless mesh network system is a guaranteeing remote engineering for a few rising and economically captivating applications. Not quite the same as the conventional system, WMN is dynamic self-arranged, self-composed and self-recuperating. This aspects makes it more appealing with lower in advance expense, less demanding system support work, more powerful system construction modeling and more steady business scope. Basically, an answer for a channel task issue figures out which one of all accessible channels ought to be allocated to a given 802.11 interface. Nonetheless, the amount of accessible channels is constrained and as more interfaces inside the same impedance extent is allotted to the same radio channel. In radio channels, channel allocation schemes are required to allocate bandwidth and communication channels to base stations, access points and terminal supplies. In this paper we will discuss distributed channel assignment methods like ROMA, SAFE, EMORE and WACA in wireless communication.

Keywords
Radio channels, wireless communication, channel assignment, TDMA, ETT, ROMA, SAFE, EMORE.

1. INTRODUCTION
Channel assignment in wireless networks has become an active area of research in these days. The significant issue confronted with WMN is the rare data transfer capacity. Remote channel is described by telecast nature when a like between two finishes are possessed, different hubs inside its scope range can't transmit which cause the low throughput of single station WMN [7]. By using different orthogonal channels to process the datagram transmission will enhance the throughput apparently. Some papers discussed theoretical aspects of multi radio networks. [11] has extended the work of [10] and analyzed the network capacity for multiple channels and interferences.

In this paper we study the channel assignment for 802.11 based multi radio wireless communication. The "multi radio" feature implies that every remote switch has two or more radio interfaces that work autonomously on distinctive channels. Along these lines, every switch is fit for transmitting and getting information all the while, but on diverse channels, and it can speak with one or more neighbors. [8] has addressed the problem of quasi-static assignment of channels to links in the context of networks with multi radio nodes.

The paper is divided in to different sections as II part introduced the topic. In III section different channel allocation strategies are given. Some common principles of channel allocations are also discussed in this section. Next part described different methods for channel allocation. And at last in V section, conclusion and future scope is given.

2. TYPES OF CHANNEL ALLOCATION STRATEGIES
Mainly we have three types of strategies for channel allocation:

a) Fixed Channel Allocation

b) Dynamic Channel Allocation

c) Hybrid Channel Allocation

2.1 Fixed Channel Allocation
In Fixed Channel Allocation or Fixed Channel Assignment (FCA) each one cell is given a foreordained situated of recurrence channels. FCA obliges manual recurrence arranging, which is an exhausting undertaking in TDMA and FDMA based frameworks, since such frameworks are exceedingly delicate to co-channel impedance from adjacent cells that are reusing the same channel as shown in **Fig.1**. An alternate disadvantage with TDMA and FDMA frameworks with FCA is that the amount of diverts in the cell stays consistent independent of the amount of clients in that cell. These results in activity blockage and a few calls being lost when movement gets overwhelming in a few cells and unmoving limit in different cells.

2.2 Dynamic Chanel Allocation
Dynamic channel

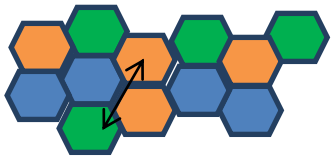

Fig.1 Reuse Distance

Allocation (DCA) actions to reduce the issue said for FCA frameworks when offered activity is non-uniform. In DCA frameworks, no set relationship exists in the middle of channels and cells. Rather, channels are a piece of a pool of assets. At whatever point a channel is required by a cell, the channel is distributed under the obligation that recurrence reuse necessities cannot be disregarded.

For example, there are three cells sharing two channels. All the cells are arranged in a line and two adjacent cells can use the same channel without violating the channel reuse constraint. In DCA all channels are potentially available to

all cells and are assigned to cells dynamically as calls arrives. **Fig.2** shows the dynamic channel allocation.

2.3 Hybrid Channel Allocation

Third classification of channel allocation uses both the techniques fixed channel allocation and dynamic channel allocation.

There are some common principles of channel allocation. These are:

Channel allocation schemes must not violate minimum frequency reuse conditions.

Channel allocation schemes should adapt to changing traffic conditions.

Channel allocation schemes should approach (from above) the minimum frequency reuse constraints so as to efficiently utilize available transmission resources.

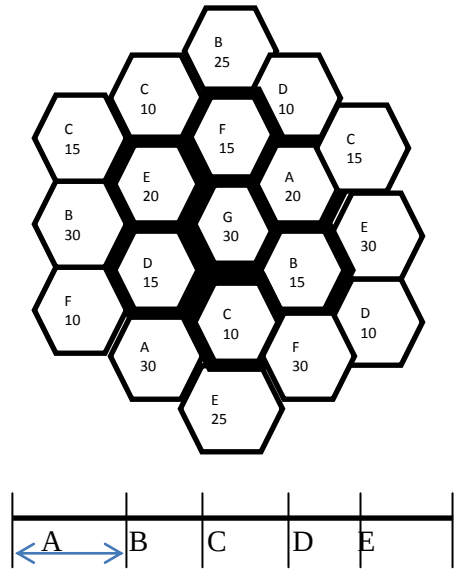

Fig. 2 Dynamic Channel Allocation

3. METHODS USED IN DISTRIBUTED CHANNEL ALLOCATION

Bandwidth available to a channel is limited, and in multiple channels this bandwidth is divided into all the channels. [2] has given a feasible channel assignment to improve network performance. SAFE (Skelton Assisted partition FrEe) channel assignment scheme used the randomized channel assignment in a distributed manner while maintaining network connectivity. This scheme was operated on dynamic networks. A network model was introduced in which an undirected graph G=(V,E) where V represented set of nodes and E used for set of wireless links. Transmission occurred when there was any edge created between these two links. [2] has also given two metrics: Throughput Based Metric and Delay Based Metric. These metrics were defined to maximize the throughput and minimize the delay in the network.

Wireless mesh network involves mainly two challenges: first how to choose high throughput and secondly external loads. As [2] has given two metrics to increase throughput and to minimize load, [4] presented ROMA, a practical, distributed channel assignment and routing protocol that achieves good multi hop path performance between every node. ROMA assigned non overlapping channels to links along gateway path to eliminate intra path interference. ROMA was the first distributed joint protocol that addressed real world challenges like lossy and highly variable channel conditions. The fundamental issue we address is: given a double radio meshnetwork, how does an appropriated convention allocate channels and select route that accomplish top of the line to-end execution.

There may arise different problems in channel assignment. One problem is to check about distributed protocol, assign channel and select routes. ROMA gave the solutions to overcome such problems. ROMA is applied on both static and dynamic allocation.

A recent work [1] based on multi radio stations has been introduced to increase the utilization of available frequency. Main motive for the work was to provide a diverse and quickly-stabilizing channel configuration based on physical topology. The work has developed the idea for each node to select a channel to minimize local objective function. This model gave a good balance between channel diversity and the network connectivity. Three baseline channel assignment strategies has been followed here. In samech(same channel assignment) all nodes were assigned to same 11g channel. In 11-rand each node was assigned one of 11 802.11g channel selected uniformly at random. And in 3-rand each node was assigned one of three orthogonal 802.11g channels selected uniformly at random. Almost 50% improvement has been noticed by using these baselines. [19] has discussed main problems occur while channel assignment for 802.11 based multi radio wireless mesh networks.

[3] has presented a new metric for routing in multi-radio, multi hop wireless networks. The main goal of this metric was to obtain high throughput between a source and destination. Different metrics like ETT(Expected Transmission Time), WCETT(Weighted Cumulative ETT) and ETX(Expected Transmission Count) were used in this study. By increasing the value of WCETT, more links can be added to an existing path. ETT calculations were made on receipt of the first and second packets. Packet loss rate is dependent on the channel utilization. [3] has taken 23-node wireless testbed for the implementation. Performance showed that on low data rates packet pair estimation but on high data it underrated the bandwidth. This was tested on both one radio and two radios. MRLQSR(Multi Radio Link-Quality Source Routing) and WCETT achieved good performance in different multi radio environment. Also [21] has given DES testbed evaluation for Distributed Greedy Algorithm (DGA) implementation based on DES Chan.

There may some networks which are unpredictable and lossy in the beginning. To overcome the problems in these networks, opportunistic routing technique is used. But up to some extent existing channel assignment techniques and opportunistic techniques may not achieve the satisfactory results. [5] has introduced a new method WACA(Workload-Aware Channel Assignment) for opportunistic routing in multi-channel multi radio wireless mesh networks. An extension to MORE was also done with the new name EMORE. WACA and EMORE achieved good performance in multi-radio, multi-channel mesh networks.

Channel assignment in normal routing and opportunistic routing become the hot topic for research in wireless networks. [6] has discussed different opportunistic routing methods in wireless networks. Opportunistic routing maximizes the robustness of the multihop wireless networks. [9] has overcome some main problem in the implementation of opportunistic routing by introducing MORE-MAC Independent Opportunistic Routing and Encoding. [13] proposed first multi-channel multi hop wireless ad-hoc network architecture. Method used 802.11 standard hardware with multiple Network Interface Cards (NIC). The bandwidth problem was bit sorted out using virtual links between all the nodes. Same way [14] has given some reason of packet loss in a 38 node urban multi hop 802.11b network. Loss rate depends upon the time scale at which loss and delivery alternate.

[16] has found out some convincible points of multi radio experimentation and resultant of mesh route architecture. From this impact of different design choices was checked.

4. CONCLUSION AND FUTURE SCOPE

The main motive of channel assignment is to increase throughput and decrease loss on the network. Towards this goal, most recent work has been done. By increasing paths or channels we can have good performance. Testbed can be expanded by adding more nodes on the network. As for future we are interested in existing channel assignment and opportunistic channel routing to improve the throughput and lossy data.

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