



## Advance Hotspot Deployment in LTE with White Space

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**Abstract:** *Today's Communication device provides consumer high speed and excellent reliability. The most of the world's progress, towards ubiquitous connectivity. A white space device gives rise to new challenges for the implementation of a wireless technology. This is a telecommunications technology that uses unused frequency bands available in any spectrum. A frequency gap called a guard band between each group to avoid interference and cross connects. Unused frequencies used by tablets, smart phones as well as business applications. White space technology fills the gaps between the frequencies used to broadcast television network speed etc. These devices give more to users in single devices with multiple applications. In this paper, we used to work on reduction of power consumption over it telecommunication by using hotspot which utilized the unused band in telecommunication or communication called as white space. In this, the hotspot device programmer to operate according to density in the area the users increase periodically because of some event occur on at areas like World Cup events Olympics, national and international sports events, festival, Shopping malls etc. Which result in reduction of annual cost?*

**Keywords—***White Space, Hotspot, Relay Mode, Direct Mode or LTE.*

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### I. INTRODUCTION

White space devices are used in unoccupied radio between broadcast TV channel frequencies, which causes a cheap source, broadband connection is present everywhere. The whole transmission to digital television will be changed due to FCC orientation. Complexes portable device FCC rules operate in spectrum white spaces that allow unlicensed radio transmitters. White space devices could be used for a variety of applications. White space devices are based on listening before talk facility. The white space spectrum, which can be used to transfer the content in the air, can be calculated easily by white space devices.

**Existing white space devices are:**

#### A. Digital TV:

Idiot box as we know as another word for TV, we use today. As the changing technology, dummy TV should change to something interactive TV.

#### B. IPTV:

IPTV are those that are based on IP, which offers more traditional digital TV than dummy TV. IPTV can provide services like on demand of the user's real time video streaming, video etc. and many features can be included in IPTV.

#### C. Direct to home television (homes):

Satellite services houses. DTH TV combines user requirements on one TV platform. He was nicknamed ' Super Wi-Fi ' superior coverage, not line of sight white space technology television network will range. TV white space covers long distance with low power consumption. It increases the data rate and provides strong signals in rural areas. White space is in the unique position to offer us high quality modular data center, 165sqm, 40 kW per rack, engineered.

Tethering refers to connecting one device to another. Tethering allows sharing internet connectivity to your phone or tablet computer with other devices such as laptops, smart phones etc. also work with wireless LAN. Tethering access an Internet through a mobile connection with any device. It can access by USB cable or Bluetooth. Tethering used unmanned radio spectrum between television channels, broadcast, which may become a source of low cost.

The hotspot is usually used as Wi-Fi technology, which physical location that has access to the internet via a wireless local area network. The hotspot is prepared with broadband internet access and one or more access points, users can access the wireless internet. Hotspot can be an internet connection that can be set in any public location support. A single access point supports up to 30 users and range is up to 100-150 feet indoors and up to 300 feet outdoors for internet access. If we want to create a single larger network than we need many access points that can be connected via Ethernet cable?

The slave's shape of the hotspot of nodes, which takes into account the efficient allocation of means among the users in the dense regions [1]. Unused broadcast TV spectrum, which is presently at 50-700 MHz bands, has gotten a lot of attention. Microsoft has been one of the techniques in the field with his development of ' meaningless ' [2]. A Wi-Fi

network, which is operated on an up-to-date database the Federal communications Commission, has mandated TVWS devices or networks to query a database to get a list of available channels on their location [3]. Similarly, in this paper number of hotspots is appropriate, and the number of slaves is limited.

## II. SYSTEM MODEL

Set the base station location in the Center (0, 0) on the network. There are U200 numbers of users. The hotspot is denoted by H and slaves are denoted by s. The approach makes to layer of transmission scheme, where layer1 consists of the base station for hotspot access and layer2 exists for hotspot of slave connection. Layer1 is used for LTE (4 g) communication and Layer2 is used for TVWS communication. In such a way that  $S \cup H = \mu$  and  $S \cap H = \emptyset$ .

In it, we deploy the user at random in an area of 100 x 100. Each node may be required interest (Ri). The value of Ri is 6. If a node is a hotspot then, does it have to satisfy its own rate requirements as well as its slaves?

If two different users then have a hotspot, hotspot and two different users will be calculated as the total rate requirements. Hotspot value of Ri = 6. The S1 value of Ri = 6. The S2 value of Ri = 6, so that the total value of Ri = 18. Which show in below figure?

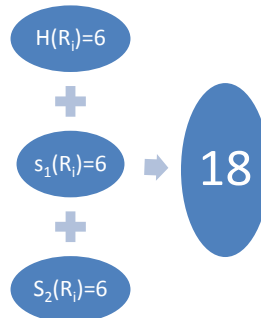


Fig 1: Total Rate Requirement

## III. METHODOLOGY

In which region x of the y axis is dependent on the user of the work, according to which the users can have a minimum area of the active connection. Then cluster formation, which is known as the K means clustering. K means choice density for per clusters of users and makes a group. Limited use can be controlled choice power consumption. If power is given correctly than the work. If it cannot consume the stream so it goes again and again.

### A. Cluster Formation:

In which K means is used for cluster formation. K means is distance check from 200 nodes and x, y axis from 200 users. Assume that we take the user U<sub>50</sub> from 200 users and check the minimum distance from the taken users. Then, it found the minimum distance value of the taken user minimum distance. It again checks the minimum value for that value which comes from the taken users. This process repeats itself again and again, then it makes a group and process repeats itself till it covers the 200 users.

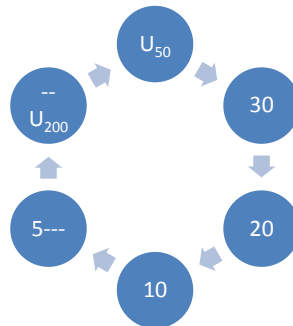


Fig 2: Find Min distance

The U50 is the taken user, this control of user the minimal distance that is 30. Then the minimal distance 30 again controls the minimal value of distance. These processes continue before this covers all the users U200 and does a group of the minimal value of distance. The above-mentioned figure shows the group.

### B. Formula for K means:

Given a group of observations  $(x_1, x_2, \dots, x_n)$ , where every observation is a real vector d-dimensional, k-means clustering has intention to share observations n into k ( $\leq n$ ) put  $S = \{S_1, S_2, \dots, SK\}$  to minimize the sum in - group of squares (WCSS). In other words, his objective is to find: s

$$\arg \min \sum_{i=1}^k \sum_{x \in S_i} \|x - \mu_i\|^2$$

Where  $\mu_i$  is the mean of points in  $S_i$ .

**C. Standard algorithm**

The most common algorithm uses an iterative technology of refinement. Due to its ubiquity it is often called the *k*-means algorithm; it is the algorithm of so called Lloyd, particularly in the community of computer science.

Given an initial group *k* means  $m_1^{(1)}, \dots, m_k^{(1)}$ , the benefit of algorithm by taking turns between two steps:

- i. *Assignment step*: Allocate every observation of the group among which media productions sum least in - group of squares (WCSS). Since the sum of squares is Euclidean distance in the square, it is intuitively meant 'closest'. (Mathematically, it means to share observations according to the diagram of Voronoi produced by means).

$$S_1^{(t)} \{x_p : \|x_p - m_i^{(t)}\|^2 \leq \|x_p - m_j^{(t)}\|^2 \forall j, 1 \leq j \leq k\},$$

Where  $x_p$  is assigned to exactly one  $S_i^{(t)}$ , Even if it could be assigned to two or more of them.

- ii. *Update step*: Calculate the new means to be the centroids of the observations in the new clusters.

$$m_i^{(t+1)} = \frac{1}{|S_i^{(t)}|} \sum_{x_j \in S_i^{(t)}} x_j$$

Since the arithmetic mean is a least-squares estimator, this also minimizes the within-cluster sum of squares (WCSS) objective.

Algorithm converged when attribution does not change any more. Since both steps optimize objective WCSS and there a number finished by such partitioning exists only, the algorithm must converge in an optimum (place). There is no guarantee that total optimum is found by using this algorithm.

The algorithm is often introduced as object allocates in the closest group by distance. A standard algorithm aims at minimizing objective WCSS and allocates so by 'least sum of squares', which is exactly identical by the way to allocate by the smallest Euclidean distance. The use of a different function of distance other than Euclidean distance (in the square) can stop the algorithm of the concurrence. Modifications different from *k*-means as spherical *k*-means and *k*-methods being offered to allow using other measurements of distance.

**D. Power consumption:**

OFDMA is used for selecting the power consumption. OFDMA is Orthogonal Frequency Division Multiplexing digital modulation scheme. OFDMA can be achieved on a multiple access by assigning subsets of subcarriers to individual users. OFDMA is a scalable, which helps connect highly suitable wireless broadband networks. It is used for multiple antennas kindness and benefit channel frequency Select ability. Maximum transmission power less provides users with low data rate.

- I. *The formula used for power:*

$$\text{Min} \sum_{i=1}^U \left\{ \frac{y_{jj}}{w_{jj} g_{jj}} + \frac{\sum_{i \neq j} Y_{ij}}{w_{jj} g_{jj}} + \sum_{i \neq j} \frac{y_{ij}}{w_{ij} g_{ij}} \right\}$$

In which  $y_{ij}$  is hotspot distance,  $w_{ij}$  is weight of hotspot and  $g_{ij}$  is gain of hotspot.  $Y_{ij}$  is distance of slaves from hotspot,  $w_{ij}$  is weight of slaves from hotspot and  $g_{ij}$  is gain of slaves from hotspot.

OFDMA is used to find the strength and rate restrictions. In this process, which we have dedicated go users each block one resource from 1 to 15 after completing 15 users again, they start from 1 to 15 users and this process until it covers 200 users. At this frequency, repeat them after completing 15 users. But, in previous paper the resource block randomly selected which is also causing repetition the same frequency in one group.

- II. *BS Rate and Power Constraint Check*

The feasibility of resource allocation perform is tested to ensure that all nodes successfully granted the requested resources to satisfy their pace starter and already if we have reached the maximum number of iterations. If this is not feasible, it means that there are not enough resources available, this step has not yet completed successfully. The BS re-clusters the nodes by increasing the cluster number and calculating the restricted users.

Table 1: Number of iterations, clusters and restricted users

Users No.	200
Iteration#	100
No. Of clusters	2
Restricted users	0

**IV. SIMULATION RESULTS**

**A. Simulation Setup:**

In this paper, is a dense wireless modeled as a square area of 100 x 100 meters. The base station can be fixed or portable mode-II TVWS devices that allow a list of channels from TVWS database. The mobile users take the mode-I or II-mode devices peer-to-peer. I-mode devices can the list of channels available TVWS. Mode-II or fixed devices contains the list of directly connected with database [1]. TVWS different mode-II devices can operate on different channels. The proportionality factor  $\alpha$  that the maximum permitted interfaces in terms of noise power determines is set to 0.5 which is given to each user for best value of the hotspot.

Consider an environment where the base station can operate on channels 26 (518-548 MHz frequency bands), channels, 22 and 24 (frequency bands 518-524 MHz and 530-536 MHz respectively) are also available for mode-II devices. Relay mode – I in which each user connects to the frequency 26 and Relay mode-II in which users connect to the frequency of channels 26, 24, 22. RM-I frequency is 15 and RM-II frequency is 45 because it's a three channels is used.

**B. Low power consumption:**

In earlier papers every user can block resource assigned, but not in frequency serial numbers or select randomly. In this paper, we repeat the order of frequency and offer every user an individual resource block. In this we give the frequency of the resource block in order of 1 to 15. After the frequency of first 15 assign users and then the frequency repeats the order of 1 to 15 and take this process to all users an individual frequency. After we complete this, the choice that the best frequency of each user for the power level. The following figure 3 in which for slaves and if for frequency where after completing the first 15 in first 15 user frequency a frequency repetition a series from 1 to 15 to another user.

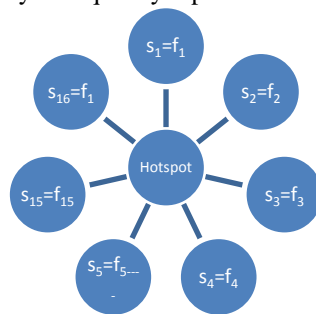


Fig 3: Assign Frequency Sequence

The earlier paper figure 4 with a frequency that is not repeated fragment or frequency randomly choose the user who tee it Show the series not repeated and each user has different frequency that does not give good results.

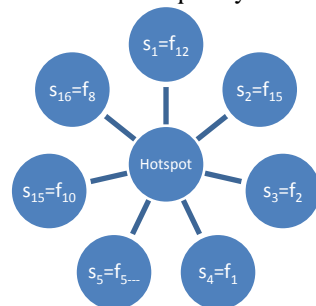


Fig 4: Assign Frequency Randomly

Re-clustering is chosen if the current resource allocation to all users does not satisfy their rate requests. Table 2 shows the power in each mode within 200 users.

Table 2: Calculating all DM and RM modes total power in mW

Total Direct Mode: LTE	83.8057
Total Direct Mode: LTE+TVWS	52.0829
Total Rely Mode-I	17.0287
Total Relay Mode-II	0.02871

Figure 5 shows a comparison between the four modes for different numbers of users ranging between 100 and 120 users. Results showed that compared to a power saving achieved in operating in relay mode and direct mode, when the number of users increases.

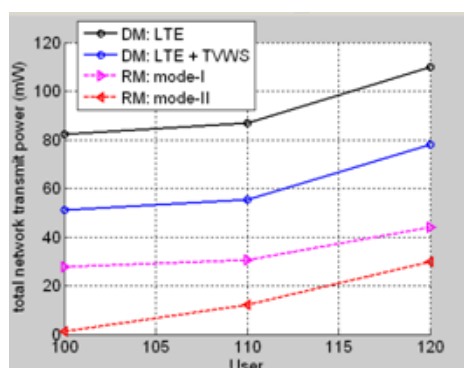


Fig 5: Transmission power vs. Number of Users

Table 3: the four modes, transmission power vs. 100-120 Users

No. Of Users	100	110	120
DM: LTE	82.213	86.46	109.364
DM: LTE+TVWS	53.243	57.75	79.784
RM-I	26.973	33.242	44.243
RM-II	5.432	16.432	32.65

The table shows results in numbers, by keeping the amount of fixed resources and increases the number of users of 100-120, save power by using Direct Mode (LTE+TVWS) and Relay Mode. By increasing the number of the user, and when it becomes a dense cell will increase the average power between Direct Mode and Relay Mode.

## V. CONCLUSION

Due to limited resources large spectral signal overhead in dense areas, one base station cannot accommodate those large numbers of simultaneous users. In this paper, we have proposed an algorithm for clustering nodes and their mobile hotspots of slaves, then allocate resources LTE and dynamically TVWS in order to reduce the total number of users is limited and the power transmission network. The simulation results show that total use of coverage area can increase considerably in the algorithm suggested using a hotspot-slave configuration (Rely Mode) compared to conventional direct mode communication (LTE).

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