

# AN ADAPTIVE ELEPHANT HERD OPTIMIZATION BASED OPTIMIZED SCHEDULING SCHEME IN OFDMA WIMAX NETWORKS

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**Abstract:** A productive way to deal with maximize scheduling algorithm for dynamic OFDMA based WiMAX framework is presented in this paper, with soul QoS provisioning, which renders for enhanced throughput. Our proposed approach progressively ascribes OFDMA assets to the clients to augment the total framework execution in assorted QoS based WiMAX frameworks and heterogeneous activity. We have inaugurated an adaptive elephant herd optimization algorithm, to attain this goal and which vigorously creates the OFDMA resources to the users to bring their QoS requirement together. To reduce complexity, we observe a user-based scheduling method. For first on its first-rate sub-channel, the user with the highest priority is tabulated. The time diversity gain attained in long-time period computation will conceived by here. Proposed algorithm highlights on individual users authentic precedence in implementing machine resources in an effort to maintain the necessities of diverse QoS parameters. for specific forms of traffic flows, a maximized scheduling approach in OFDMA-primarily based WiMAX networks is suggested to obtain each throughput and a fulfill QoS implementation. Simulation is applied in MATLAB software and effects have mounted substantial development of performance

**Key words:** WiMAX, OFDMA resource allocation, QoS, Adaptive Elephant herd optimization, scheduling.

## 1. INTRODUCTION

Rapid growth of wireless technology, with the explosive development of the Internet, and coupled, for wireless data services, and has raised the demand. It renders fast, astounding distant web information rate on longer separations to extensive geological regions. Some of the advanced features of Mobile WiMAX are the brilliant reception apparatus advances, multicast and communicate service and partial recurrence reuse [1].

In non-line of sight environment, the Mobile WiMAX framework accepts orthogonal recurrence Division Multiple Access (OFDMA) which is a multiplexing strategy that subdivides the

transmission capacity into various recurrence sub-transporters for created multipath execution. OFDMA sub-channelization method connected by WiMAX gives high versatility and support to various application conceding voice, information, video gushing. Recurrence reuse factor, shrewd receiving antenna strategy, portability and power administration make WiMAX more effective to render bigger scope and high throughput [2].

The next generation broadband wireless applications need high data rate, low latency, minimum delay, real-time applications; in short highly demanding Quality of Service (QoS), which cannot be realistically rendered unless the transmitter power, limited system resources, and bandwidth are intelligently applied and properly maximized. Optimization strategies generally effort to dynamically match the requirements of data-link associations to the physical layer resources available to optimize some system metric. The algorithm and optimization objective improved so far for dynamic resource allocation in OFDMA systems mostly conceive instantaneous gain in system performance, where the system is either to achieve maximum aggregate throughput or to render fairness between the users or to have a trade-off among them [3].

The higher statistics rate, portability, versatility and Quality of Service these are the notable highlights of Mobile WiMAX. The shrewd antenna advances, multicast and communicate service and fragmentary recurrence reuse these are propelled highlights. One of the significant ongoing applications of Mobile WiMAX is the Internet Protocol Television. Video, voice, and information are all IP data services but each has its own Quality of Service (QoS) requirements. For video

administrations, high accessibility, adequate ensured transmission capacity, low broadcast delay and jitter are the QoS condition [4].

As a forecasting substitute for creating the next broadband wireless metropolitan region networks (WMAN) these are taken into deliberation by using WiMAX. In a WiMAX network, the two types of stations are there, one is the base station (BS), which has a wired reference to the outside web; the inverse is the subscriber station (SS), which turns into the radio data transfer capacity from the BS and further serves its adjacent projects from a household or a business LAN [5].

For a multiuser system, the characterization of information theoretic channel capacity is a complex optimization trouble. To attain decoding, channel capacity and highly complex coding such as maximum likelihood detection or multiuser detection with successive decoding require to be applied. Therefore, we restrict our concentrates on exclusive assignment of each resource dimension to only one user to neglect the complexity and the error propagation problems. We permit only one user to situate a dimension associated to a particular frequency at a particular time for in other words [6].

High spectral performance and high robustness are vital necessities of cellular mobile conversation structures. Consequently, orthogonal frequency division multiplexing (OFDM) is one of the candidates for the broadband air interface of cellular mobile information systems beyond 3G. OFDM renders an excessive robustness against time dispersive multipath fading channels in one the one hand. Then again, to the most appropriate transmission scheme, OFDM offers the flexibility to modify the transmission rate consistent with subcarrier (narrowband transmission channel) [7].

## II. RELATED WORKS

To guarantee better QoS, the asset distribution and scheduling the calculation in Opportunistic Layered Multicasting rendering multicasting of layered video over compact WiMAX. The data based conveyance of subcarriers is associated for setting up at essentially. Nithyanandan and J. Susila @ Sandhiya, *et al.*, [1] have proposed for Nithyanandan and J. Susila @ Sandhiya, *et al.*, [1] to decrease the burst overhead, delay and jitter, SWIM (Swapping Min-Max) calculation is utilitarian and recommended by L for likewise. Another promising advancement that

can altogether develop the framework execution by means of looking through the telecom idea of remote stations and the coordinated effort between various customers is the Cooperative Multicast Scheduling (CMS) procedure.

For looking at portable WiMAX limit in enhancement and community planning is introduced. For blended application clients, the execution of the product is built upon an explanatory way to deal with choosing IEEE 802.16e portable WiMAX gadget's ability, throughput, and a movement variant. Stand-out overheads that influence the ability of the framework are tried. A well-ordered depiction of the assessment is made and a float diagram for the determination to be had the transmission capacity and most extreme scope of clients upheld is introduced an analytical technique and software program which was altered for carrier renders to assess the number of base stations that had been spread in a afforded area has been developed by S. O. Ajose and O. L. Erhuen, *et al.*, [2].

With individual QoS provisioning, a proficient way to deal with expand valuable asset allotment for dynamic OFDMA essentially based WiMAX structures is introduced, which renders priority decided asset assignment. The plan progressively modified the OFDMA assets to the clients and boosted the general framework execution in heterogeneous traffic and assorted QoS based WiMAX frameworks has been created by Arijit Ukil, Jaydip Sen, Debasish Bera, *et al.*, [3].

An expanded reserved technique in OFDMA-based WiMAX systems to acquire both upgraded framework throughput and a fulfill QoS usage for unprecedented sorts of site guests streams has been invented with the aid of Hanwu Wang, and Weijia Jia, *et al.*, [5]. Our scheduling scheme admits components, one is the aid allocation for every person; for distinctive traffic periods, the opposite is the QoS scheduling.

A Generalized Proportional Fair (GPF) scheduling algorithm, which accepted to tweak the change-off among fairness and throughput performance for quality attempt traffic in a mobile downlink situation has been developed via Christian Wengerter, Jan Ohlhorst and alexander Golitschek Edler von elbwart, *et al.*, [7]. Equated to a gadget without frequency scheduling, this maximizes the machine

throughput and gets a developed fairness with recognize to the installed sources and with appreciate to the attained information-fee in line with user.

### III. PROPOSED APPROACH

One key issue is the manner by which to inspect the perfect transmission charge (capacity) over each activity direct in a remote transmission machine. The Shannon strategy gives the maximal transmission expense over a managed channel as  $C = B \log(1 + S)$ , where  $B$  is the recurrence bandwidth of the channel and  $S$  is the SNR (a trademark for channel kingdom). But, in practice, the Shannon potential  $C$  is a most useful price which isn't achievable. Consequently, over the complete WiMAX device, we ought to similarly hire the ideal channel ability determination scheme.

Give us a chance to consider an OFDMA WiMAX framework with  $N$  (portable) individual stations and  $m$  traffic channels. Without loss of all-inclusive statement, we utilize notations  $MS_i$  and  $C_i$  to refer each WiMAX consumer station and sub channel respectively. Specifically the transmission fee created by way of a consumer msn over a specific sub channel  $C_m$  inside a WiMAX body might be communicated as,

$$Rn(m) = rn(m) * sn(m) \quad (1)$$

The  $rn(m)$  refers the normalized transmission charge in formulation (1) (in line with availability) for client msn over sub channel  $C_m$ , i.e. that's evaluated by way of the  $msn$  adjustment degree over the subchannel  $C_m$  as portrayed previously. The parameter  $sn(m)$  delineates the quantity of availabilities set up to customer msn inside the present body and  $s$  is the full wide assortment of schedule vacancies inside each WiMAX outline. Established on it we will similarly grow to be a transmission throughput  $T(m)$  evolved on sub-channel  $m$  from all its users as,

$$T(m) = Rn(m) = rn(m) * sn(m) \quad (2)$$

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#### Algorithm 1 Traffic Scheduling

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1. At the beginning of each frame
  2. Perform the bandwidth allocation in order for UGS (ertPS), rtPS, nrtPS and BE, respectively.
  3. Get a transmission rate  $R_i(t)$  for each  $MS_i$  ;
  4. Perform Admission Control for each type as follows  $A_1$  For a UGS or ertPS session  $ii$  with request of  $r_{ii}$ .
    5. *If* ( $r_{ii} R_i(t)$ )
    6. Accept the flow  $ii$ ;  $R_i(t) \leftarrow R_i(t) - r_{ii}$  ; Else Reject flow  $ii$ ;
  7.  $A_2$  For an rtPS flow  $ij$  with request of  $r_{ij}$  *If* ( $r_{ij} R_i(t)$ )
    8. Accept flow  $ij$  ;  $R_i(t) \leftarrow R_i(t) - r_{ij}$ ;
    9. Else *If* (flow  $ij$  is within its delay deadline  $d_{max}(ij)$ ) Put flow  $ij$  into the rtPS waiting queue;
    10. Else Reject flow  $ij$ ;
  11.  $A_3$  For a nrtPS flow  $ik$  with a minimal request of  $min(ik)$  *If* ( $min(ik) R_i(t)$ )
    12. Accept flow  $ij$  ;  $R_i(t) \leftarrow R_i(t) - min(ik)$ ;
 Else Put  $ik$  into the nrtPS waiting queue;
  13.  $A_4$  For a BE flow  $il$ 
    14. *If* ( $R_i(t) > 0$ )
    15. Allocate a fair share of  $R_i(t)$  to  $il$ ; Else Put  $il$  into the BE waiting queue;
  16. End Process.
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For our traffic scheduling set of rules first separates all the traffic flows into diverse (five) types allowing to their extraordinary QoS necessities and for in preference to making use of the mixed scheduling weight, and then agenda them in a priority way until all of the to be had assets are applied. Notice that a few of the scheduling for every form of traffic flows, the multiuser diversity is also exploited over every channel to enable high overall performance. Therefore, our scheduling scheme is top of the line in both the throughput QoS delight and optimization. For maximizing we are applying adaptive elephant herd optimization algorithm.

Initial elephant population is firstly separated into  $k$  clans in AEHO algorithm. Each member  $j$  of clan  $i$  moves allowing matriarch

where matriarch is the elephant  $ci$  with the best fitness value,

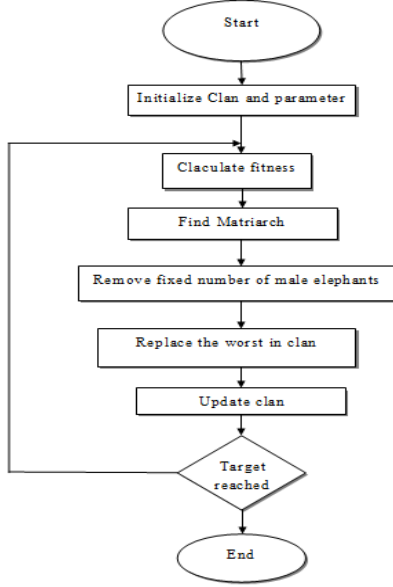


Figure.1. Flow chart for AEHO

$$x_{new,ci,j} = x_{ci,j} + (x_{best,ci} - x_{ci,j}) \quad (3)$$

where  $x_{new,ci,j}$  represents novel position of elephant  $j$  in clan  $i$  and  $x_{ci,j}$  is its old position,  $x_{best,ci}$  is the best solution of clan  $ci$ , in the later presents of the algorithm, the algorithm's parameter which evaluates the influence of the matriarch and  $r2$  is random number applied to develop the diversity of the population.

Position of the best elephant in clan  $x_{best,ci}$  is up by the following equation,

$$X_{new,ci} = x_{center,ci} \quad (4)$$

Elephants that flow far away from the clan are applied to version exploration. In each clan  $i$  a few quantity of the elephants with the worst values of the goal feature are travelled to the radical positions. By disposing of the worst we are able to determine the first-rate positions. The great position is given returned to premiere scheduling algorithm.

Table 1: The result obtained based on Capacity Bit rate and coverage rate

Methods	Capacity Bit Rate	Convergence Rate
OFDMA	3.1	20
EHO	4.6	16
AEHO	6.2	14

The convergence rate decreases for proposed method and the capacity bit rate increases for proposed method. We set up radio assets on a packet with the aid of packet basis inside the suboptimal algorithm. at the scheduling  $c$  programming language, the packet with the best precedence cost from all queues is tabulated for transmission, and the process iterates till both there may be no radio aid left or there is no packet remaining unscheduled in the queue those are the same old concept. in set of rules three, an in depth description of the useful resource allocation set of rules is listed, where  $\Omega_{sk}$  is the set of sub-channels require for facts transmission for person  $k$ ,  $\Omega_{qk}$  is the set of queues having pending visitors of consumer  $k$ ,  $sn$  is the variety of residual time slots on sub channel  $n$ ,  $ik$ ,  $j$  is a pointer to the subsequent packet to be scheduled in the  $j$ th queue of person  $ok$ , and  $li$  is the most queue length.

The proposed algorithm first pre-allocates the best sub-channel  $n$  in phrases of the channel great to person  $ok$  from his available sub-channel set if person  $ok$  has pending visitors. if there isn't always sufficient potential left at the best sub-channel  $n$  to house one packet from consumer  $okay$ 's queue, that is, if  $sn < d\mu_k, n(t)$  sub-channel will be neglected from person  $okay$ 's available sub-channel set and the second best sub-channel  $n'$  will be selected. This technique continues till a high-quality feasible sub-channel is pre-allocated to person  $ok$ . In any other case, from the list, person  $k$  is neglected. After the sub-channel pre-allocation manner for all customers is performed, the algorithm calculates the priority fee of the pinnacle-of-line (hol) packet in each non-empty queue, and schedule the packet with the best priority value,

$$(ok^*, j^*, i^* okay, j, n^*) = \arg \max P(k, j, lk, j, n)$$

For transmission on sub channel  $n^*$ . In phrases of time slots are subtracted on sub-channel  $n^*$ , and the scheduled packet is removed from the representing queue and the consumed radio assets. In the queue, then it starts off evolved from the beginning and maintains until either there is no radio useful resource left or no packets pending.

#### IV. SIMULATION RESULTS AND DISCUSSION

To check our proposed technique we implemented MATLAB R2013b and experiments had been accomplished on the platform with INTEL R CORETM i7-3770k CPU at 4ghz, 8gb ram, home windows 10 expert OS. Within the network the reenactment comes about situated from the proposed AEHO execution are taken to compute the QoS parameters which incorporate basic throughput, put off, reasonableness file allowing to the assortment of clients. In writing review, from the impacts, it's far really meant and recognized that the deferral is more prominent diminished than the being contemplates works talked about. The proposed AEHO strategy is additionally compared with the local portion of sub channels that are dispensing the sources allowing to the accessibility establishment. In OFDM WiMAX systems, yet its miles imagined without considering the channel circumstances. The results are controlled by a remarkable arrangement of targets and target forces of the clients to the subcarriers with needs of clients. Experimental effects are mounted in parent. Quantity of users as opposed to packet put off is mounted in figure 1. In figure 2 quantity of customers versus average throughput is established. In figure 3 number of users versus spectral efficiency.

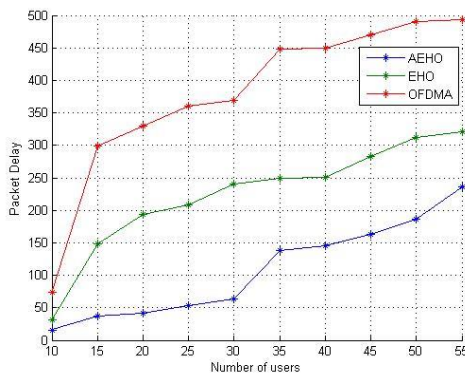


Figure.2. Number of Users versus average Packet delay

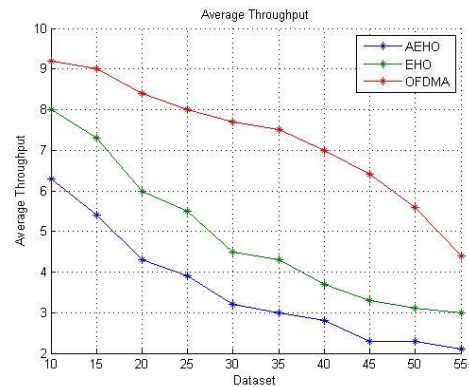


Fig. 3. Number of Users versus Average Throughput

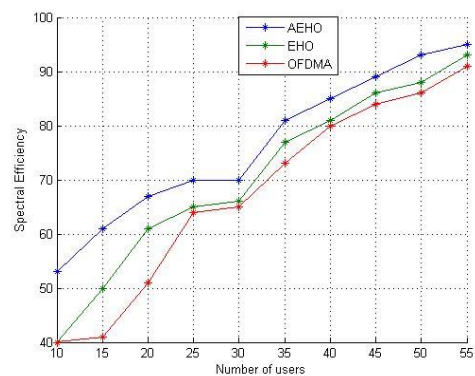


Figure. 4. Number of Users versus Spectral Efficiency

#### V. CONCLUSION

We suggest a singular most effective resource allocation and scheduling algorithm by way of this paper. This optimization set of rules approaches two stages. The primary stage chooses subcarriers which fulfilled fee requirements of each consumer. The second one degree assigns each subcarrier for simplest one consumer mounted on its channel country information. On diverse eventualities, the simulations had been performed. In phrases of average equity and throughput, the simulation results show that the iterative processing with optimum AEHO of the two-degrees develops OFDMA structures overall performance. the performance of the proposed algorithms is decided in phrases of packet put off through machine-degree simulation, throughput, outage opportunity and spectral performance it's miles mounted that the optimum scheme acquire higher spectral performance, throughput, and lower packet put off, outage chance equated with the traditional scheme.

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