Volume 6, Issue 6, June 2016 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Delay Analysis of MEEF Scheduling Algorithms in the WiMAX

Lokesh Kumar*
M.Tech. Student, Department of CSE,
Yagyavalkya Institute of Technology,
Jaipur, Rajasthan, India

Ankur Goyal
Assistant Professor, Department of CSE,
Yagyavalkya Institute of Technology,
Jaipur, Rajasthan, India

Abstract— Wireless communication has the exponential growth in the field of cellular telephony, wireless internet and wireless home networking. Worldwide Interoperability for Microwave Access (WiMAX) is the broadband wireless technology that attracts the researchers. A new generation of handheld devices is present that allows users access to stored data even when they travelling. Users set their laptops down anywhere and get permission to access all networking resources. WiMAX is the vision of wireless networks. WiMAX has lot of challenges. In this paper the overview of the WiMAX is given. The architecture, IEEE 802.16, Quality of Services, different scheduling algorithms etc. are discussed. Along with this the new algorithm is also proposed and the result is discussed.

Keywords— WiMAX, Scheduling, QoS, EEF, Delay, Voice traffic.

I. INTRODUCTION

WiMAX (Worldwide Interoperability for Microwave Access), is a broadband wireless technology that is developed by the WiMAX Forum. It is based on the IEEE 802.16 standard [1]. It provides the solution for fixed and mobile broadband wireless access (BWA) networks. It is providing support to the different kind of multimedia applications that include real-time as well as non-real-time applications. WiMAX has advantages such as high transmission rate and predefined quality of service (QoS) framework, enabling efficient and scalable networks for data, video, and voice [2].

WiMAX works on the basis of IEEE 802.16 protocol. According to the IEEE 802.16 standard, WiMAX support two modes of operation – First one PMP (point to multi point) mode and second is mesh mode.

A WiMAX PMP network is capable to provide the last-mile access to a broadband Internet service provider (ISP). The mesh mode implies the requirement of supporting multi hop ad hoc networking by Subscriber Station (SS). The WiMAX network architecture consist one Base Station (BS) and a number of SS. The BS can allow accessing the Internet facilities, a relay station (RS) behave as a SS which can forward the traffic to BSs or other RS, and a mobile station (MS) is an SS which can move in the network. The mesh mode of the WiMAX is more flexible. It can be used to deploy the infrastructure then the PMP mode [3].

The IEEE 802.16 standard common place three varieties of transmission mediums supported because the physical layer (PHY): single channel (SC), OFDM and OFDMA. There are four varieties of modulations supported point-to-multipoint (PMP) mode within which the SS is not allowed to communicate with any other SSs but the BS directly. Depending on the transmission direction, the transmissions between BS and SS's are classified into downlink (DL) and uplink (UL) transmissions. Time Division Duplex (TDD) and Frequency Division Duplex (FDD) supported in IEEE 802.16. Both UL and DL transmission scan not be operated simultaneously in TDD mode but in FDD mode. The fastened or all applications connect to the central BS, the BS receives transmissions from multiple sites and sends to net directly or via alternative BSs. End users (laptop, telephone, computer, .etc.) inside the building, through in building networks like Ethernet or WLAN, can connect to an outside CPE and then connect to the IEEE 802.16 network [4].

There exist five different scheduling service types in 802.16 standard MAC layer. The five scheduling service types areas following -

A.Unsolicited Grant Service (UGS): UGS scheduling service is designed to support applications that generate fixed-size data packets periodically such as T1/E1 and VoIP without silence suppression. [5].

B. Real-time Polling Service (rtPS): rtPS scheduling service is designed to support real-time applications that generate variable size packets on a periodic basis such as MPEG video or VoIP with silence suppression.

*C. Non real-time Polling Service (nrtPS):*nrtPS is designed to support non-real time applications that require variable size data grant bursts on a regular basis.

D. Best Effort (BE): BE traffic class contains applications such as telnet or World Wide Web (WWW) access that do not require any QoS guarantee.

E. Extended Real-time Polling Service (ertPS): The extended real time polling service (ertPS) was developed at the same time as mobile WiMAX and is a combination of UGS and rtPS.

Scheduling algorithms are responsible for Distributing resources among all users in the network, and provide them with a higher QoS. Weighted Round Robin (WRR), Channel Condition Independent Packet Fair Queue (CIF-Q), Channel State Dependent Packet Scheduling Algorithm (CSDPS), Improved Channel State Dependent Packet Scheduling (I-CSDPS), Server Based Fair Approach (SBFA), Weighted Fair Queuing (WFQ), Packet Fair Scheduling (PFS), Integrated Cross-layer Scheduling, TCP-aware Uplink Scheduling, Strict Priority (SP), Round Robin (RR), Weighted

Round Robin (WRR), Weighted Fair Queuing (WFQ), Self-Clocked Fair (SCF) Queuing [6,7] etc. are the main scheduling algorithms used in the WiMAX.

The research paper is divided in five sections. First section gives the introduction of WiMAX, QoS, different scheduling algorithms etc. Second section gives the literature survey. The third section gives the proposed algorithm. The fourth section gives the results of the proposed algorithm. In last section conclusion is given.

II. LITERATURE SURVEY

Lot of work is done by the different authors to improve the Quality of services of WiMAX. In [8] AneelOad et al proposed Earliest Expiry First (EEF) algorithm. The EEF algorithm designed as an extraction from the hybrid sub scheduling EDF algorithm. In [9] the Zuber Patel et al proposed novel packet queuing scheme Low Latency Weighted Round Robin (LL-WRR) which is simple and effective amendment to weighted round robin (WRR) for achieving low latency and improved fairness. In [10] Dr. B. Sridevi et al proposed a new approach by which a critical area is found and then overlapping area between serving base stations and neighbouring base station are found and tabulated. In [11] P. S. Kumaresh et al proposed an uplink dynamic weighted scheduling approach for WiMAX. The scheduling algorithm works on the bases of the bandwidth requests of SSs in the uplink direction. The proposed approach is considered as an uplink scheduling algorithm in the MAC layer of BS. In [1] M. Deva Priya et al implemented scheduling algorithms like Earliest Deadline First (EDF), Weighted Fair Queuing (WFQ) and Deficit Weighted Round Robin (DWRR) for intra-class scheduling. Performances are analyzed in terms of Delay, Packet Loss and Throughput. The results illustrate that EDF provides better QoS for traffic with variable sized packets. In [12] KireJakimoski et al proposed priority based uplink scheduling scheme for IEEE 802.16 standard that improves the QoS performances. The proposed priority scheduling scheme assume that each SS carries single service flow. According the proposed ertPS service class has the highest priority and is served first.

III. PROPOSED WORK

The EEF algorithm [8] has the following limitations –

1. The transmission time of the packet is not considered. When packet is send from the source then it is below the deadline but when it reaches at the destination after the transmission time then it has no importance because the deadline is crossed.
2. All the packets with high and low priority are transmitted. This creates delay in the network.

The limitations degrade the performance of network by increasing the delay. So an improved algorithm is required.To overcome the drawbacks of the EEF, a new algorithm is proposed that is Modified Earliest Expiry First (MEEF) Algorithm. The Modified EEF algorithm is designed to controls and monitors packets using their Remaining Valid Time (RVT) of the packet. The RVT is calculated from the TTE value calculated in the EEF algorithm and the priority of the packet. Thus, packets are scheduled based on RVT value. Packets which have lower RVT value are scheduled first.

The proposed Modified EEF algorithm has considered the transmission time of the packet. Those packets which are present in the queue are more sensitive for expire their deadlines. If the deadline is crossed than the packet is useless. In the Modified EEF algorithm calculate the RVT as follows –

Any packet has the current time “Current_time” and packet arrival time “Packet_ar_time”. The waiting time “Waiting_time” in the queue is calculated as –

Waiting_time = Current_time - Packet_ar_time

Each packet has the deadline that will not be crossed. Now the time to expire TTE is calculated as –

TTE = Deadline - Waiting_time

The packet is transmitted from the source to destination, so it takes transmission time “Tr_Time”. When voice traffic is taken then some of the packets are not important. These not important packets can be discarded. The Packet discard priority “Packet_Dicard_Priority” is added in the RVT. When packet can be discard able then a value 0.100 is added. So the Remaining Valid Time RVT is calculated as-

RVT = (TTE – Tr_Time) + Packet_Dicard_Priority

Now the packet that has the RVT value greater than the Deadline of the packet, it is discarded. The remaining packets are compared and packet which has the less RVT value is served first. The Modified EEF algorithm ensures that the packet reaches to the destination before the deadline. Due to the removal of low priority packet, the delay decreases. The Implementation of the Modified EEF algorithm is performed in the high performance scientific programming language MATLAB 2013 that is more suitable for the high level calculations.

IV. RESULTS

The Modified EEF algorithm delay results shown in table 1. In the table 1, delay increases from top to bottom as the number of packets increases. The increase in the packet creates congestion of packets in the network.As the number of packet increases, delay increases. From packet =1 to packet =3, there is more change in the delay from 0.006 to 0.0071 sec. The minimum delay is 0.006 sec. for packet = 1. The maximum delay is 0.0383 sec. for 20 packets in each node.

Table I Modified EEF Algorithm – Delay Results at Node = 6

Node = 6		
Node	**Packet**	**Delay**

6	1	0.006
6	3	0.0071
6	5	0.0128
6	10	0.0247
6	15	0.0359
6	20	0.0383

V. CONCLUSION

WiMAX is an emerging wireless communication system that is expected to provide high data rate communications in metropolitan area network. WiMAX is uses the IEEE 801.16 protocol. Different scheduling algorithm have been developed to serve the packets like Round Robin, Weighted Round Robin, Deficit Round Robin, Multiple Downlink Fair Packet Scheduling, EDF, EEF scheduling algorithm etc. The EEF algorithm has drawbacks that the transmission time of packet is not considered. To remove the problems of EEF algorithm, a new algorithm is proposed called Modified EEF algorithm. The algorithm is implemented in the MATLAB and result obtained for node = 6 and 1, 3, 5, 10, 15 and 20 packets at each node. The delay increases when number of packet increases at each node.

ACKNOWLEDGMENT

I will be very thankful to Er. Tara ChandSoni(Member IETE) for his cooperation.

REFERENCES

[1] M. Deva Priya, M. L. Valarmathi, D. Prithviraj, "Performance Analysis of Scheduling Mechanisms in WiMAX Networks", SOP Transactions on Wireless Communications, Vol. 1, No. 1, March 2014.

[2] Marcio Andrey Teixeira and Paulo Roberto Guardieiro, "A new and efficient adaptive scheduling packets for the uplink traffic in WiMAX networks", EURASIP Journal on Wireless Communications and Networking 2011.

[3] Ashish Kaushik, "Mobile WiMAX Security, Architecture and Assessment", International Journal of Electronics and Computer Science Engineering IJECSE, Volume1, Number 1, 2014.

[4] Nilesh M. Verulkar, Dr. Umesh S. Bhadade, "Analysis of Bandwidth Recycling in IEEE 802.16 Network Using PSA, RB-RFA & HSA", International Journal of Engineering Trends and Technology (IJETT), Volume 12, Number 2, Jun 2014.

[5] AvniKhatkar, Yudhvir Singh, VikasNandal, " A QoS Oriented Analysis of ertPS, rtPS and nrtPS flows in WiMAX", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 7, July 2013.

[6] Avinash Kaur, Harvinder Singh, Parveen Sharma, "Bandwidth Allocation Scheduling Algorithms for IEEE 802.16 WiMax Protocol to Improve QoS: A Survey", International Journal of Computer Applications, Volume 98– No.11, July 2014.

[7] Ala'a Z. Al-Howaide, Ahmad S. Doulat, Yaser M. Khamayseh, "Performance Evaluation of Different Scheduling Algorithms in WiMAX", https://arxiv.org/ftp/arxiv/ papers/1111/1111.2996.pdf.

[8] Aneel Oad1, Shamala K Subramaniam, Zuriati Ahmad Zukarnain, "Enhanced uplink scheduling algorithm for efficient resource management in IEEE 802.16", EURASIP Journal on Wireless Communications and Networking 2015, 3, 2015.

[9] Zuber Patel, UpenaDalal, "Design and Implementation of Low Latency Weighted Round Robin Scheduling for High Speed Networks", International Journal of Wireless & Mobile Networks (IJWMN) Vol. 6, No. 4, August 2014.

[10] Dr. B.Sridevi, Akshathachindu.M, G.Abinaya, "Reducing handoff delay by adaptive threshold tuning and location updates in mobile WiMAX", International Journal of Information Sciences and Techniques (IJIST) Vol.4, No.3, May 2014.

[11] Mr. P.S.Kumaresh, Ms.M.S.Vinodini, Dr.A.V.RamPrasad, "A Dynamic Uplink Scheduling Scheme for WiMAX Networks", International Journal of Innovative Research in Science, Engineering and Technology, Volume 3, Special Issue 3, March 2014.

[12] KireJakimoski, Toni Janevski, " Priority Based Uplink Scheduling Scheme for WiMAX Service Classes", I.J. Information Technology and Computer Science, 2013, 08, pp.66-74.

