A Review on the MAC Dynamic bandwidth allocation for OFDMA-PON

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ABSTRACT
This paper represents the orthogonal frequency division multiple access passive optical network (OFDMA-PON) as a promising solution for next level PON due to its high spectral efficiency and flexible bandwidth allocation scheme. Various techniques are used by different researchers for orthogonal frequency division multiple access. So far, an OFDMA-PON technique has been widely accepted. It shows that the various DBA schemes have been proposed to enhance the performance of the network. The overall objective of this research paper is to compare the different techniques based on OFDMA-PON and investigate the performance of various independent services.

Keywords
Dynamic bandwidth allocation, Orthogonal frequency division multiple access passive optical network, multiple access layer.

1. INTRODUCTION
Orthogonal Frequency Division Multiplexing (OFDM) which is utilized as a part of various present day correspondence frameworks, for example, LTE, Wi-Fi or WiMax for the most part on account of the accompanying reasons: resistance to channel restrictions, versatility, edibility and execution possibility [1]. To apt such demand, OFDMA-PON has been a promising hopeful of next level PONs as a result of its favorable circumstances, for example, high transmission limit, high spectral proficiency and adaptable data transfer capacity designation conspire. Focusing on the higher unearthly effectiveness of OFDMA, bit-and-power loading (BPL) gives larger amount m-QAM (m is the variable level of QAM) organization for every individual subcarrier. There have been connected works concentrating on the MAC layer conspire. There are two sorts of MAC plan, in particular fixed burst transmission (FBT) and direct circuit transmission (DCT) separately in. The FBT conspire, with the end goal of accomplishing the measurable multiplexing addition of OFDMA, regards every information transmission as a fixed burst, and utilizes the interleaved polling with adaptive cycle duration (IPACT) algorithm. DCT regards every information transmission as a dynamic brief/seemingly perpetual circuit, and utilizes transfer speed estimation to give the objective QoS [1]. DBA calculation that permits the optical line terminal (OLT) to concede the optical system units (ONUs) transmission capacity with both status and non-status based calculations in.

2. OFDMA-PON DESIGN
The topology of indicate multipoint OFDMA-PON is appeared in Fig. 1.[1] The framework comprises of an OLT situated at the central office (CO) and a few ONUs at the customer side. The downstream information traffics from the CO under the controlling of the OLT are transmitted to all ONUs. The upstream transmission is a great deal more confounded, in light of the fact that the OLT needs to gather the line status before allocation of each. Therefore, this paper principally emphasize on the procedure of upstream asset allocation. ONUs is separated into three SLAs (SLA1 to SLA3 display high to low prevalence). In each ONU, there are three lines serving three need classes of service (CoS0 to CoS2 display high to low superiority) as appeared in Fig. 1. ONU check asks for their line status intermittently [2-3].

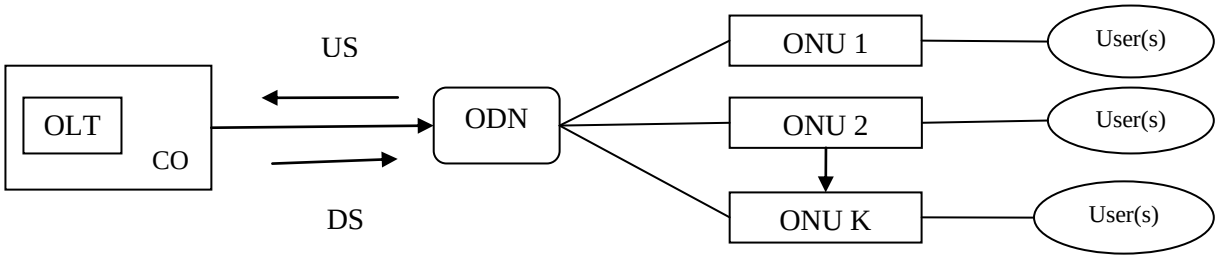

Fig.1 OFDMA-PON architecture [1]

3. COMPARISON OF TECHNIQUES
Table 1. shows the comparison of techniques used by researchers to evaluate the performance of the proposed dynamic bandwidth allocation schemes[1]. Mainly three techniques are considered here namely; TDM scheme,NEC scheme,and Proposed scheme and we will consider the advantages and limitations of all these techniques. Further, will consider the proposed MAC DBA scheme to enhance the performance of the system network. From the below given table the comparison of performance of these three techniques are shown and how they reduce the bandwidth waste,perform under heavy load conditions. From this

analysis the proposed scheme is better than other two schemes and work better.

Table 1. Comparison of techniques

S.No	TDM Scheme	NEC Scheme	Proposed Scheme
1.	In this one or more OFDMA frames which are adjacent in time are occupied by a single ONU.	In this scheme OFDMA frames occupied between different ONUs.	This scheme achieve its goal of minimum bandwidth wastage when ONUs are less in no.
2.	It causes the wastage of bandwidth in last allocated frame of an individual ONU.	It reduces the bandwidth waste comparative to TDM scheme.	It can almost remove the bandwidth waste.
3.	The mode of ONUs mapping with time order will cause many times of laser switching, so it introduced IFGs.	Inter frame gaps (IFGs) are also exist in this scheme too.	Inter frame gaps are eliminated in this scheme.
4.	TDM scheme has not working in heavy load conditions.	NEC scheme also unable to work under heavy load conditions.	This scheme has near perfect performance under heavy load conditions
5.	Worst scheme due to IFGs and frame space waste.	Better than TDM.	Better than other two schemes.

4. RELATED WORK

Yafan Liu et al.[1] proposed two DBA algorithms which can act on different stages to achieve high bandwidth utilization and evaluate the performance of the network by using simulations. Lei Deng et al.[2] considered just a single beneficiary at each optical system unit (ONU) is required to recognize both LAN movement and EPON downstream activity, which makes the proposed framework straightforward and practical. Meihua Bi et al.[3] proposed calculations accomplish less TGT(Total grant time) and higher channel usage contrasted and conventional arrangement conspire. Christos Papathanassiou et al.[4] examined strategies with adaptable channel input and we investigate the exchange off between the measure of Channel State Information (CSI) to the transmitter and the framework performance. Jing Zhang et al.[5] , proposed four optical system units (ONUs) transmit upstream information at four diverse recurrence groups and the orthogonal band multiplexed 10-Gb/s OFDM flag is all things considered got to approve the plausibility of the engineering. Cheng Lei et al.[6] proposed in this the transmission execution of a solitary ONU is enhanced and to lessen the assembling intricacy, the framework transfer speed is similarly dispersed to the ONUs in the event that they work at various bitrates. Yating Wu et al.[7] An utility capacity is characterized and data transfer capacity portion issue is then defined as augmenting the entirety of the weighted aggregate utility capacity so fall ONUs. Roberto gaudino et al.[8] portrayed the advantages and disadvantages of the two diverse methodologies with regards to high limit cutting edge PON basically as far as physical layer transmission exhibitions, additionally presenting some examination as far as many-sided quality, cost and power utilization. Cheng Ju et al.[9] The equipment cost of each ONU is significantly diminished. The proposed versatile transmitter front end plan is required to be a promising applicant of cutting edge rapid PON. chongfu zhang et al.[10] The cycle parameters of the mapping equation are set as the security keys, which are safely transmitted amongst OLT and ONUs. Yunfeng Peng et al.[11] proposed a Dynamic Bandwidth Allocation (DBA) plot for cutting edge OFDMA-PON to oblige remote signals. We change DBA into a multi-target enhancement issue. Neeharika Jana et al.[12] The DBA calculation is utilized to proficiently share the upstream optical data transfer capacity among the Optical Network Units (ONU).Maria C. Yuang et al.[13] By modifying the framework parameters, the MAC plan can accomplish an extensive variety of deferral and reasonableness execution under an assortment of activity examples. Wansu Lim et al.[14] proposed observing window time system is utilized where OLT measures the condition of the ONU's line as opposed to trading customary report messages.

5. LITERATURE SURVEY

The work of various authors who have been discussed their various techniques and their benefits and limitations of using them. There are so many techniques based on orthogonal frequency division multiple access passive optical networks like: MAC dynamic bandwidth allocation scheme, scalable LAN emulation, time slot allocation, collective reception of multiplexed data streams, MIMO-OFDMA access systems, chaos based IQ encryption etc.

Table 2. Literature Survey

Author	Year	Work done	Benefits	Limitations
Yafan liu et al.	2016	Staged optimization algorithms based MAC dynamic bandwidth allocation for OFDMA-PON	Achieve higher bandwidth utilization and ensure the equity of ONUs.	Standard numerical values have used to improve the performance of OFDMA-PONs system.

Ying Zhao et al.	2011	Experimental demonstration of an improved EPON architecture using OFDMA for bandwidth scalable LAN emulation.	Only one receiver at each ONU is required to detect both LAN traffic and EPON downstream traffic, simple and cost effective	Use different no of subcarriers and modulation formats.
Meihua Bi et al.	2012	Joint subcarrier channel and time slots allocation algorithm in OFDMA passive optical networks.	Achieve less total grant time and higher channel utilization compared with traditional sequence scheme and less collision.	Do not provide analysis about the user delay and realization of scheduling about subcarriers and time slots.
Jing Zhang et al.	2012	Collective reception of orthogonal band multiplexed data streams for OFDM-PON upstream transmissions.	Different fiber lengths from ONUs are collectively received and demodulated using one receiver, when the OFDM signals are in a synchronous state.	The transmission performance will degrade because time delay and laser line-width may lead to the de-correlation of optical carriers.
Christos Papathanassiou et al.	2013	Dynamic radio resource and interference management for MIMO–OFDMA mobile broadband wireless access systems.	High spectral efficiency in high speed networks and high velocity ,fast fading	Flexible, scalable and low rate feedback is achieved only by varying channels
Cheng Lei et al.	2014	Dynamic and balanced capacity allocation scheme with uniform bandwidth for OFDM-PON systems.	Reduce manufacturing complexity and fully utilize the processing ability of the receivers and cost sensitive.	Coherent detection is not suitable for the ONUs because it is too complex and expensive**.**
Yating Wu et al.	2015	Minimum cost maximum flow algorithm for upstream bandwidth allocation in OFDMA passive optical networks.	Better quality of service and eliminates the synchronization need at the ONU side, low packet delay and high throughput performance**.**	The problem of bandwidth allocation is only addressed by using the MCMF algorithm**.**
Silvio Abrate et al.	2015	Review and comparative assessment of FDMA-PON vs. TDMA-PON for next-generation optical access networks	High level linearity and significantly higher bit rate per wavelength.	To achieve complete compatibility new PHY specifications are required and limitations in available bit rates.
Cheng Ju et al.	2016	Experimental demonstration of a scalable transmitter frontend technique in IMDD-OFDMA-PON upstream scheme	Reduce the sampling rate of digital-to-analog converter (DAC) and the complexity of digital signal processing and hardware of each ONU is decreased.	The feasibility of the scheme has been demonstrated at fixed values.
Wei zhang et al.	2016	Chaos based IQ encryption for PAPR reduction and security enhancement in OFDMA-PON system.	Simultaneous low PAPR and high physical layer security, cost effective, low energy consumption and high signal transmission capability.	High peak to-average power ratio is the major drawback and introduce nonlinear distortions and also vulnerable to the attacks aiming at the lowest layer
Yunfeng Peng et al.	2013	Dynamic Bandwidth Allocation for Next-generation OFDMA-PON to Improve QoS.	Low delay, feasible and fast bandwidth allocation.	ONU fairness and time delay satisfy under varying traffic conditions.
Neeharika Jana et al.	2010	Performance Analysis of Dynamic Bandwidth Allocation Algorithms for Long-Reach PONs.	Provide coverage beyond range and efficiently share the upstream optical bandwidth.	Throughput varies largely with change in maximum grant size in case of multi-thread polling.
Maria C.	2012	A High-Performance OFDMA PON System Architecture and Medium	High reliability,scalability,spect	Unbalanced power fading

Yuang et al.		Access Control.	rum efficiency and cost effectiveness.	problems occurs.
Wansu Lim et al.	2011	QoS aware MAC Protocol for OFDMA-PON.	End to end packet delay and throughput is high.	Performance of middle and low priority packet temporarily degraded.

6. GAPS IN LITERATURE

The majority of existing researchers have focused on the bivalent dynamic bandwidth allocation and the use of fuzzy theory is ignored to enhance the dynamic bandwidth allocation rate further. Some of the algorithums were introduced to achieve higher bandwidth utilization and to improve the performance of the system network. Moreover, the subcarrier scalability issue is also ignored.

7. CONCLUSION

An OFDMA-PON has being considered for next level PONs due to its high transmission capacity, high spectral efficiency and adaptable data transfer capacity designation conspire. The novel method based on MAC dynamic bandwidth allocation for OFDMA-PON. But still there are some issues that it has not been considered the throughput varies largely with change in maximum grant size in case of multi-thread polling. So this paper shows about the comparison of various techniques based on OFDMA-PON. Somehow, flexible and scalable low rate feedback is achieved only by varying channels. The subcarrier scalability issue is also ignored. So, in near future we will evaluate the fuzzy based dynamic bandwidth allocation (DBA) algorithm for OFDMA-PON by using MATLAB software. Different evaluation parameters will be considered for experimental purpose i.e. average delay, average throughput, overhead analysis, packet loss rate. Therefore, future enhancement will be done by introducing membership functions in fuzzy logic to enhance the performance of the network.

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