

Dynamic Bandwidth Allocation Algorithm for Fiber Wireless Network

Mahesh M Yadav, Prof. R. A. Pagare

ME Student, Dept. of Electronics and Telecommunication, Trinity College of Engineering and Research Kondhwa-
Saswad Road, Bopdev Ghat, Pune, Maharashtra (India) SavitribaiPhule Pune University, Pune, Maharashtra, India
Professor, Dept. of Electronics and Telecommunication, Trinity College of Engineering and Research Kondhwa-
Saswad Road, Bopdev Ghat, Pune, Maharashtra (India) SavitribaiPhule Pune University, Pune, Maharashtra, India

ABSTRACT: Fiber Wireless (FiWi) gives an answer that joins gigabit inert optical framework and Wi-Fi to give enormous breaking point and furthermore adaptability bolster. To manage the transmission limit in FiWi, a dynamic transmission limit conveyance is proposed in this paper where it uses time division distinctive access at the optical part additionally, Carrier Sense Multiple Access with Collision Avoidance at the remote part. Two systems are used for the figuring, one using status announcing and the other is using non status detailing. It exhibits that both estimations have their own particular inclination and hindrance. The refinements were seen to be immaterial in any case. For the status revealing, it has 4.6% higher information exchange limit utilization than non-status detailing and non-status announcing has 5.24% lower delay diverged from status revealing.

KEYWORDS: Fiber Wireless, Carrier Sense Multiple Access, Collision Avoidance

I. INTRODUCTION

Remote correspondence is the trading of information or power between no less than two concentrations that are not related by an electrical channel. The most broadly perceived remote progressions use radio waves. With radio waves partitions can be short, for instance, several meters for television[clarification needed] or to the degree thousands or even countless for significant space radio trades. It wraps diverse sorts of settled, flexible, and helpful applications, including two-way radios, mobile phones, individual advanced associates (PDAs), and remote frameworks organization. Distinctive instances of employments of radio remote advancement fuse GPS units, garage door openers, remote PC mice, consoles and headsets, headphones, radio beneficiaries, satellite TV, impart TV and cordless telephones. Inactive optical systems (PONs) are by and by being passed on in broad numbers worldwide and will expect a relentlessly imperative part in future broadband get to frameworks. PON was created at British Telecom in the late 1980s. The primary thought was to use time division multiplexing to confine the available association transmission limit over various supporters. The fiber mastermind between the central office outfit and the customer's equipment would be totally latent. This was solidly prodded at the time by the tolerably high cost of lasers (costing commendably over US\$1000 around then) and the low rate of customers information transmission (correspondence was the essential application). Thus, a remarkable measure of research was begun to study PONs. PONs has been seen as a basic bit of various Fibers to the Home (FTTH) strategies. Essentially, PONs is engaging in light of the fact that they oversee on fibers driving from the central office out to serve the gatherings and diminish the amount of optoelectronics at the central office, bringing prompt and unusual venture reserves. In any case, quite a while has snuck past since the main headway of PON until the generous game plans happening today. There are both particular and money related clarifications behind this. Dormant optical frameworks are fiscally appealing in light of the fact that couple of customers can share fundamental resources. Consistently, upto 64 customers can share a PON port on an OLT

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II. MOTIVATION

In past decade there is a monstrous change in the field of broadband get the chance to network and progressions because of unendingly addition in number of customers towards web office which can gives a better stage than customers to get the opportunity to web in at whatever time wherever versatile way. The broadband organizations in a general sense require a higher information transmission, better versatility with lower cost get the chance to network to customers. Starting late, Fi-Wi advancement itself is exhibiting an essential contraption in the field of media transmission by its own specific merits over existing developments. The present development like Passive Optical Organize (PON) offers better information exchange limit and soundness however at high cost due to costly optical contraptions. One additionally encouraging development is Wireless Mesh organize (WMN) which gives organizations at lower cost with versatility however having compelled information transmission on account of channel impedances. Along these lines, Efforts are put to join the advantages of existing headways propose new development named as "Fi-Wi" which giving better speed as we are moving nearer towards 4G and 5G correspondence level. Fi-Wi underpins a ton of data rate (Up to the demand of Gbps) so any kind of disillusionment in framework causes an enormous measure of data adversity i.e. Hereafter, survivability is huge stress in Fi-Wi sort out in light of the fact that it is described as limit of framework to continue with its organizations after a mistake. Generally dissatisfaction occurs in back-end of the framework i.e. in optical compose side more than the front end (remote framework) in the framework. Since remote front end has the self-recuperating property because of its work topology which helps it to reroute its activity on a disappointment yet optical back end has tree topology which having a greater likelihood of getting disappointment.

III. OBJECTIVES

High utilization is one of the design goals for MPCP-based dynamic bandwidth allocation (DBA) algorithms in GiGabite passive optical networks (EPON). However, utilization is sacrificed in order to meet the delay limits of the applications in most DBA design schemes. This paper proposes a dynamic bandwidth allocation algorithm based on sorting report messages with additive-polling thresholds (AP-Sort DBA). This has the characteristics of high utilization and low delay during medium network loading. AP-Sort DBA is an extension of the adaptive dynamic bandwidth allocation algorithm with sorting report messages (Sort-DBA) and promotes utilization by reduction of unused slot remainders (USR) and distribution of excess bandwidth. For performance evaluation in terms of average delay, average queue size, loss rate and utilization, five DBA schemes are simulated, namely AP-Sort DBA, interleaved polling with adaptive cycle time (IPACT), dynamic bandwidth allocation. Our focus is how the wireless upstream traffic based on CluLoR going into the optical access network performs when conventional wired traffic is included in the optical network. We evaluate the delay performance for different practical scenarios and examine the underloading and overloading of the wireless and wired traffic respectively on FiWi networks. Our evaluations indicate that the performance impact of DBA algorithms depends on the source of the traffic and we provide comparisons in this project.

IV. LITERATURE SURVEY

In literature, the problem and the previous techniques of Fiber Wireless is described N. Kumar ET.AL Gigabit passive optical networks (GPON) give a limit supports in both the total bandwidth and bandwidth efficiency using bigger variable-length packets in Passive Optical Networks innovation. They have depicted an absolutely detached GPON perfect reach extender utilizing disseminated Raman enhancement and announced the enhanced examination through execution of a square root module by a separation of 60 km at information rate of 2.5 Gbps. An effective change in Q element is accomplished with square root module, which additionally helps in expanding the length of GPON.[1]

T. Tsagklas et.al [2] Proposes the brief description of the FIWI network. The system frameworks change the future applications of the system. With transmission capacity i.e. bandwidth request being expanded exponentially and with customers inquiring for consistent availability regardless of where they are it is clear that get to systems should be

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upgraded with colossal abilities that were not required before. Both optical and remote advances were developed all through the most recent decades as far as data transmission limit and QoS support of customers. Tens or even several Gb/s in expansive separations of a few Kilometers were accomplished with the utilization of optical filaments while broadband administrations have vanquished moreover the remote market space. However both advances exhibit inconveniences which dissuade them from being considered as the last answer for future system frameworks. Then again, FiWi systems involve another rising innovation that joins the upsides of both optical and remote systems. A few optical and remote innovations can be coordinated under different structures in request to give high broadband openness to both settled and versatile customers since the colossal limit of optical filaments can be joined with the adaptability that remote systems offer. One such approach is the idea of Radio-and-Fiber FiWi arranges in which optical and remote innovations, as PONs, AONs, WiMAX, and so forth are being coordinated either in equipment or programming prompting to new half breed arrange designs.[2]

The paper proposes the brief description of the gigabyte i.e. the scope of the GPON systems are characterized, in general, by an Optical Line Termination (OLT) system and an Optical Network Unit (ONU) or Optical Network Termination (ONT) with a passive Optical Distribution Network (ODN) interconnecting them. There is, in general, a one-to-many relationship between the OLT and the ONU/ONTs respectively.[3]

G. Kalfas et.al [4] They have presented the idea of medium transparency in MAC protocols for 60 GHz RoF systems showing a MT-MAC convention that is able to do progressively assigning both optical and remote limit and assets. Medium-straight forwardness depends on two parallel running dispute periods with settled dataframe structures requiring wavelength selectivity works just at the RAU site, permitting along these lines for similarity with totally detached system usage and for telecom administrator straightforward fiber-organize foundations. They have exhibited broad execution assessment comes about for transport and PON models of RoF system topologies, both for Poisson and for burst-mode activity at bit-rates up to 3 Gb/s, affirming in all cases the upgraded capability of our convention to effectively adjust to the system topology while giving broadband 60 GHz LAN usefulness.[4]

In this article, they introduce interestingly a Medium Transparent Access Control Protocol that arbitrates traffic channeled through both optical and remote media being fit for serving different RAUs and various remote clients dispensing just a predetermined number of wavelength assets. Our plan depends on a organize engineering that utilizes tun able wavelength filtering RAU designs and remote uplink and downlink channel era. They exhibit simulation based execution examination uncovering that our plan can give high throughput and little postpone values for numerous remote clients dispersed over the system notwithstanding when a predetermined number of wavelengths is accessible.[5]

In this review they discussed and evaluate the assess plan issues that must be managed in a PON get to arrange. In particular, to drive the cost of an get to arrange down, it is essential to have a proficient adaptable arrangement. They accept that a PON in view of surveying and with information epitomized in Ethernet outlines has exceptionally attractive qualities, for example, utilization of a solitary downstream what's more, a solitary upstream wavelength, and the capacity to arrangement a fragmentary wavelength ability to every client. They display a basic algorithm for element data transmission distribution in light of an interleaved surveying plan with a versatile process duration. They propose a novel approach for an in-band flagging that permits utilization of a solitary wavelength for both downstream information and Grant transmission. Likewise, they demonstrated this way to deal with be adaptable with the quantity of ONUs in the framework. Since each ONU utilizes the window measure required right now, the surveying process duration adjusts to the immediate line loads, driving to a versatile process duration. This is the essential thought behind the reasonable unused transmission capacity redistribution: lessened process duration prompts to an expansion in the measure of best-exertion transmission capacity accessible to occupied ONUs. This expansion is corresponding to their transmission capacity needs.[6][7]

This paper gives the brief idea about the GPON and basic architecture of the GPON. GPON recognized the need to develop PON to Gigabit capable solution for transporting Ethernet and IP traffic. GPON is the most developed PON

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convention in the commercial center today. it offers far higher proficiency when contrast with ATM and Ethernet based PON advancements. GPON give the more drawn out transmission and higher transfer speed. GPON is indicate multipoint instrument and is one of the best decisions for the broadband get to organize. The GPON speed is more than other PON standards[8]

V. PROPOSED SYSTEM

In this paper, we simulate a network with a combination of wired and wireless traffic in FiWi Network, introduce a DBA space and qualitatively analyze it, which to the best of our knowledge, have not been extensively analyzed before in literature. An interesting practical application is the Cloud mobile host implementation, where we have multiple mobile hosts accessing data from Cloud servers. Cloud server are examples of heavily loaded wired networks, and mobile hosts are wireless nodes connected to the gateway at their average data rate. We also analyze the delay performance of different DBAs and propose the usefulness of each DBA for specific scenarios that are of practical importance we introduce dynamic bandwidth allocation (DBAs) for the fiber network and the importance of it when used with wireless network. We introduce a DBA space for the FiWi networks which combines different combination of grant transmission of the fiber network with that of the wireless network. The wired network follows the MPCP protocol (Multi-Point Control Protocol) in a time-sharing basis in the upstream direction and broadcast protocol in the downstream direction as used in IEEE 802.3ah.

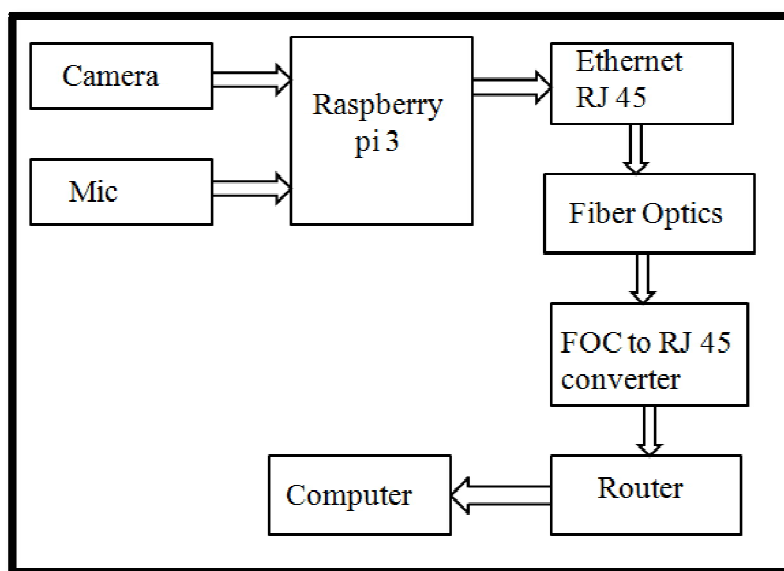


Fig No 01 System Architecture

The MPCP protocol requires REPORT messages to be sent from the ONU to the OLT, with the information of the packets in the queue at the ONU, corresponding to which a GRANT message is sent to the ONU granting the necessary bandwidth to send the queued packets based on specific DBAs. The ONU and Gateway follow a point-to-point (P2P) protocol, and have a duplex mode transmission, thus upstream and downstream transmissions do not collide. The wireless network follows a two-head Cluster Head transmission. The Raspberry Pi is a series of small single-board computers. Which is used for the execute the programs on the board the camera and the mic is the input data given to the raspberry pie board the rj 45 ethernet is used RJ45 plugs highlight eight (8) pins to which the wire strands of a link interface electrically. Each plug has eight areas (positions), dispersed around 1mm separated, into which singular wires

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are embedded utilizing special cable crimping tools. The industry calls this sort of connector 8P8. Then the converter is used to convert the data FOC then the signal i.e. the output is displays on the computer

VI. FLOW OF THE SYSTEM

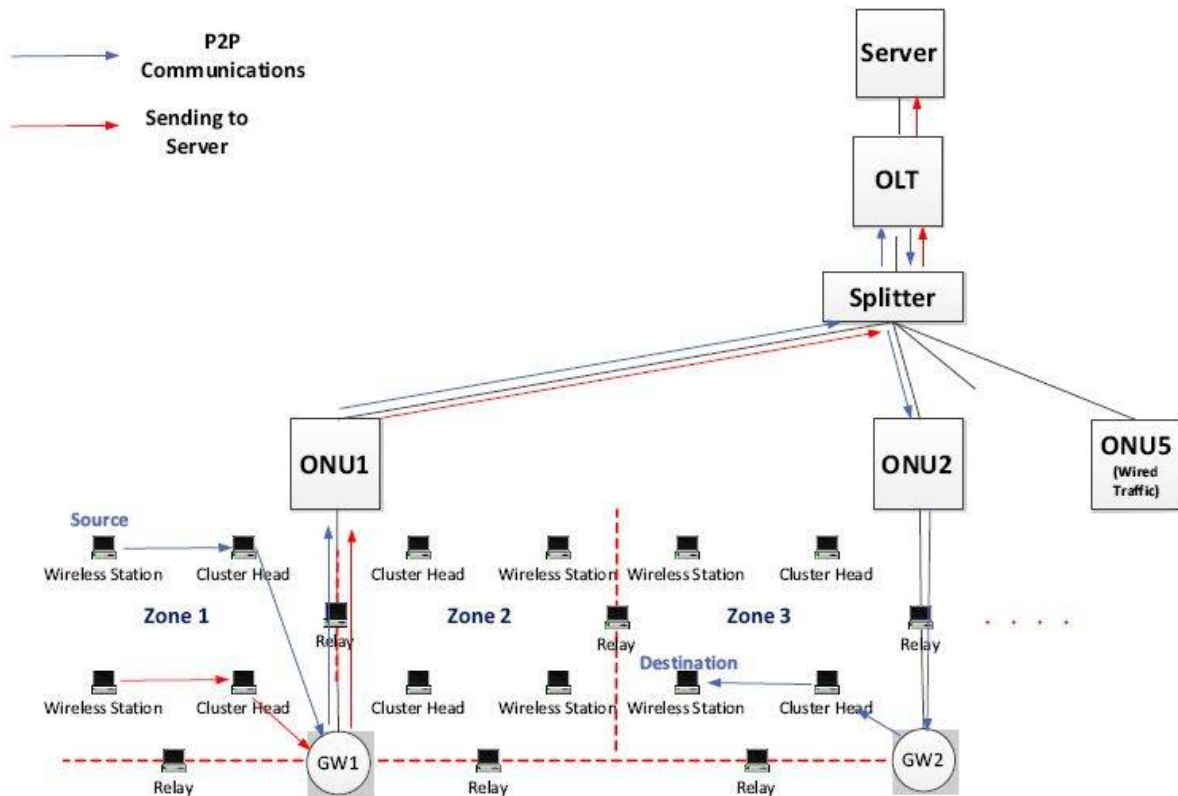


Fig No 02 Flow of the system

Explanation-

One of the main challenging problems in FiWi networks is to find an efficient routing protocol to route the traffic between wireless nodes within the wireless network or through the wireless network to the optical network to reach the Internet, example [6], [13]–[16]. Most of the routing protocols that were proposed for FiWi considered flat topology with no clustering structure. In our recent paper, CluLoR [17], we combine clustered scheme with a localized routing scheme which proved to give better overall delay-goodput performance when compared to a routing scheme that focuses on minimum hop-count. Recent work on FiWi networking focuses on green networking and protection techniques in order to have a reliable FiWi network, see e.g., [18]–[20].

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VII. EXPERIMENTAL SET UP AND RESULT

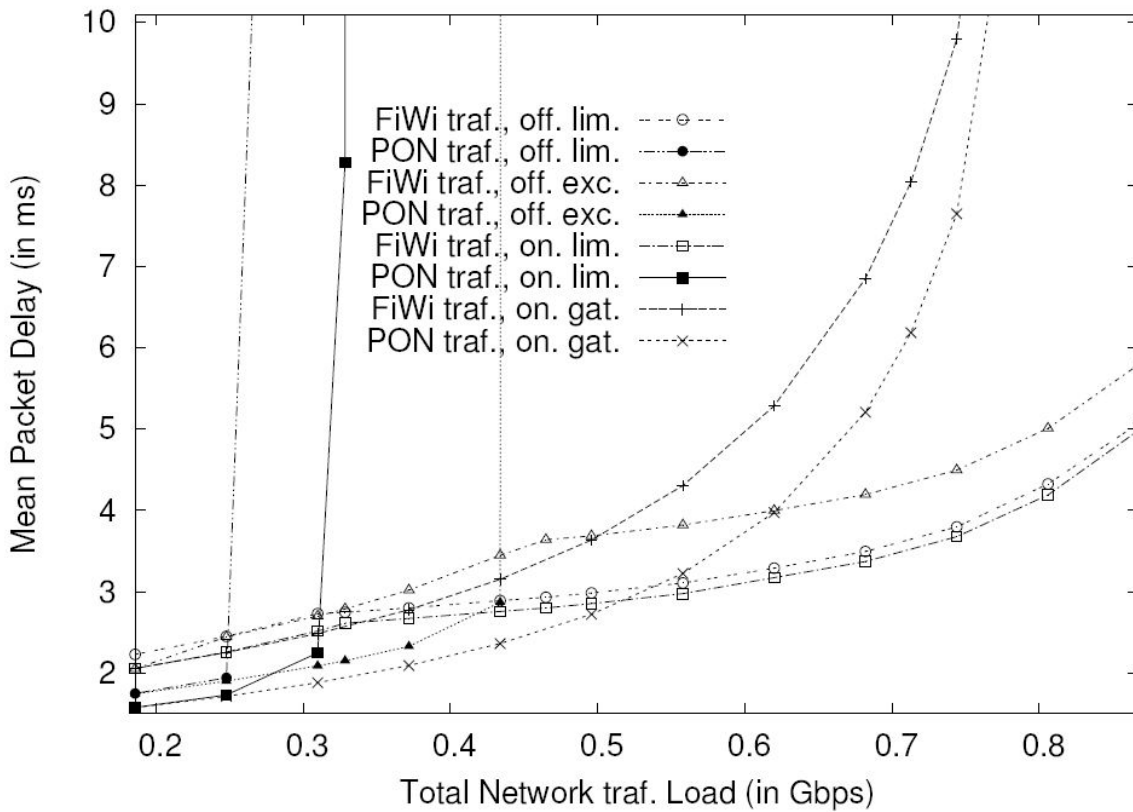


Fig No 03. Total Network traf. Load (in Gbps)

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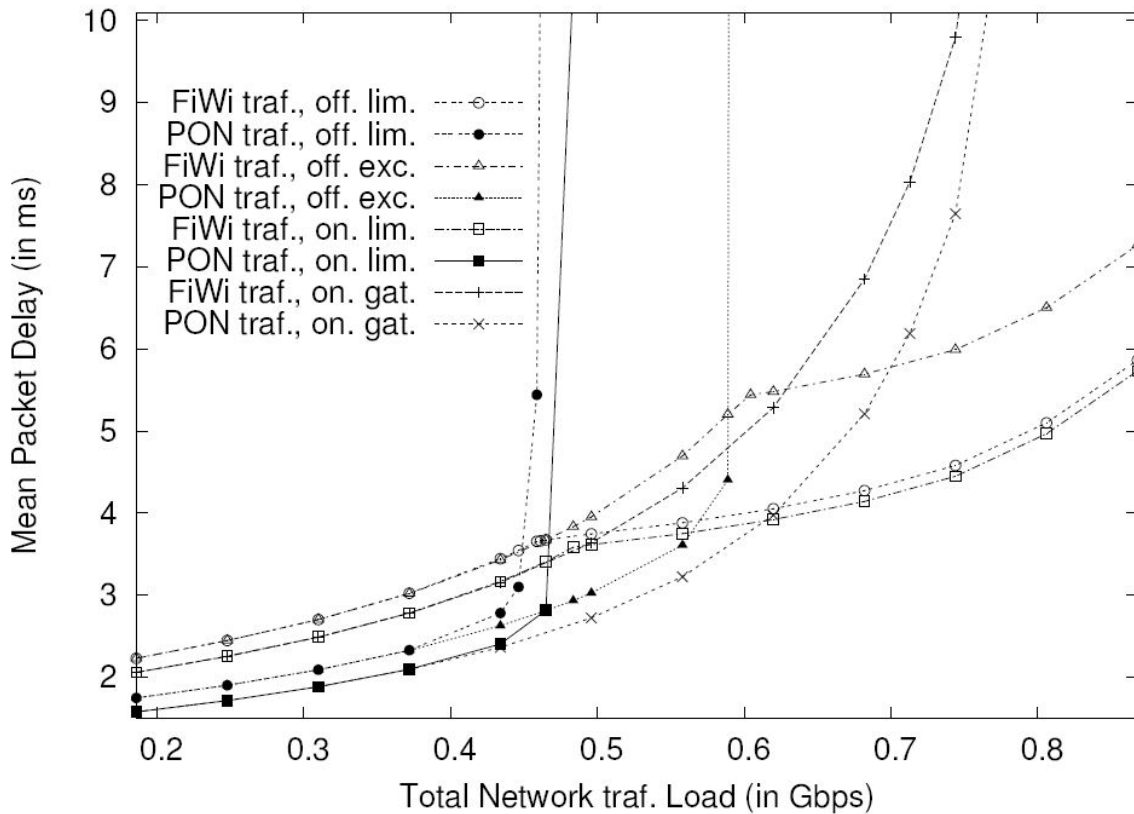


Fig No 04. Total Network traf. Load (in Gbps)

As for the mean end-to-end delay for the packets to reach the server, two scenarios were considered as mentioned above. Factors that affect the delay values are the number of hops a packet needs to travel to get to the server, and the queuing delay of cluster heads especially if most of the traffic has to go through the cluster head. The traffic can be outgoing traffic of the zone or incoming traffic to the zone since some peers are communicating with each other. Having incoming and outgoing traffic in a scenario would lead to higher interference and packet collisions in a zone which causes some of the wireless nodes to send their packets multiple times to reach the next node. Higher interference and packet collisions would lead to increase the queue of the cluster heads and cause buffer overflow. The cycle time equation for FiWi network can be given as:

$$Z = O(2\tau P + tG + 2tC + tg), \quad (1)$$

Where Z is the cycle time, τP is the propagation time for the PON Network, tG is the average Grant size allocated for the ONUs in that cycle, tC is the transmission time of the Control message (REPORT and GRANT), and tg is the guard time. While the PON is covering the Z cycle time, correspondingly multiple cycles of data transmission from Gateway to the OLT with average cycle period of 493.7 bytes and with the overhead about 511.7 bytes for the quad mode packet distribution and from the wireless station to the Gateway are simultaneously occurring. These transmission are masked in the cycle time as the links can work in parallel. Based on the cycle time equation, for $Z = 2$ ms, we receive a Grant size (in bytes) of 28142 bytes (or $tG = 0.22$ ms) for each ONU. Although the ONUs connected to the wireless stations can go up to a maximum of G_{max} of 28142 bytes, the wireless loads almost never reach this load value in most

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practical scenarios due to its net utility capacity. As we mentioned the incoming traffic ratio into the ONUs is 1:30 (FiWittraffic:PON traffic). Based on that it is clear that the first 4 ONUs that are serving the FiWi traffic are lightly loaded when compared to the second 4 ONUs that serve PON traffic.

VI. CONCLUSION

In this paper, we proposed a multi-OLT PON structure for both FTTH terminals and WSN. A modified interleaved polling algorithm and scheduling algorithm of a control message were also proposed. From the computer simulation results, evaluating average packet delay, it is found that the proposed structure can reduce the end-to-end latency about 0.1ms up to the offered load of 0.6 while 0.2ms at offered load of 1.0 for both uniform and non-uniform traffic loads. Moreover, the multi-OLT PON can accommodate 5% more traffic load than the single-OLT PON without suffering from congestion. Therefore, it can be mentioned that the multi-OLT PON can effectively connect CHs of large WSN to make a converged network with FTTH terminals of a u-City with latency efficiency. The analysis performed in this study using the existing FS and LS bandwidth allocation schemes for both uniform and non-uniform traffic conditions proves the validity of the proposed multi-OLT PON structure. Moreover, the proposed multi-OLT PON structure with modified interleaved polling algorithm also outperforms other existing single-OLT polling algorithms in terms of throughput for nonuniform traffic load with LS scheme. Furthermore, it is found that the convergence of FTTH and WSN in a multi-OLT PON is an efficient approach in that it provides a cost-effective solution than using two separate PONs, less packet delay, improved bandwidth. Carriers can increase revenues by providing oversubscription, and can improve customer satisfaction by providing low latency PON. The quality of the DBA used is proportionately translated to increased carrier revenues. The only way to achieve both oversubscription and low latency PON is by implementing a DBA algorithm. A DBA algorithm minimizes latency, improves utilization and should respond quickly to the changing traffic patterns. The DBA algorithm should be SR-based, to make the best gains possible. When implementing SR-DBA in the GPON upstream channel, the operator can oversubscribe and provide 5 Gbps and beyond of allocated upstream bandwidth by leveraging the traffic burstiness. Through statistical multiplexing and ONT reports, latency is reduced by as much as 90%.

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