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Optimization of Dynamic Bandwidth Allocation Algorithm for Passive Optical Network

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Abstract: The article adopts the method of analyzing the dynamic bandwidth allocation of the next-generation passive optical network(PON), and proposes a dynamic bandwidth allocation algorithm that supports the quality of service(QoS) and the level of service.

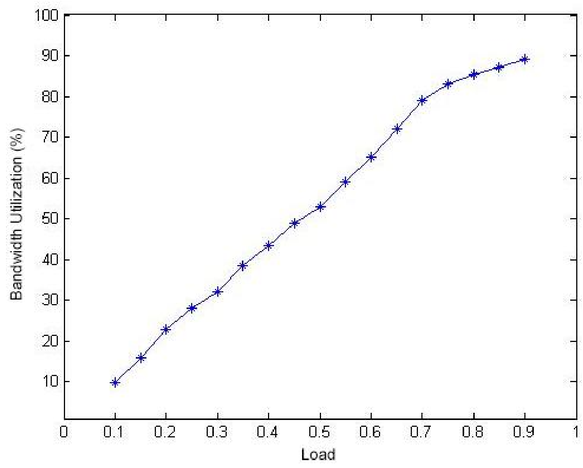
1. Introduction

- Passive optical network (PON) can provide bandwidth-rich services at a low cost and is one of the important ways of 5G hosting networks. In recent years, PON technology has been continuously improved, from time-division multiplexing of passive optical networks (TDM-PON) to next-generation passive optical networks (NG-PON).
- We studies the dynamic bandwidth allocation (DBA) algorithm and designs a more optimized resource allocation algorithm.

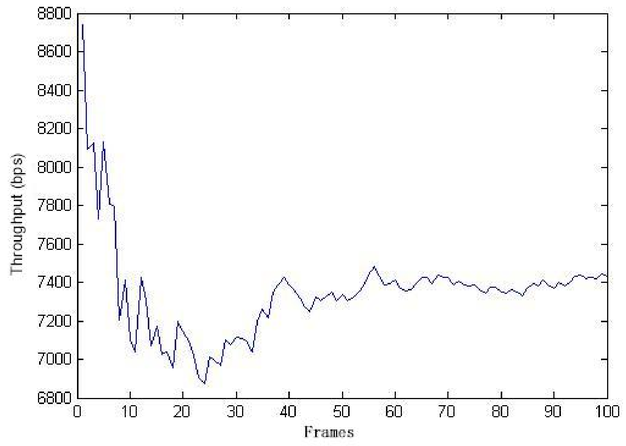
2. Experiment

- Improved algorithm : Each ONU's EF class business sends and transmits at the beginning of one cycle and continues to upload the AF and BE services for the remainder of the cycle after transmission completion. Transfer only the high-priority EF class, analyzing the EF cycle of the low transmission business and the AB cycle of the AF service and the BE service constitute the entire system cycle. Only one protection time in two sub-cycles ensures that the QoS, for the Class EF business avoids delay jitter without unnecessary bandwidth waste.
- At the beginning of the cycle, the OLT assigns the bandwidth to the ONUs, in the authorization order of the previous cycle and then uploads the EF service.
- A protection slot exists when the EF subcycle is complete. Afterwards, OLT launches the AB subcycle to allocate bandwidth to the AF and BE businesses and adds reporting frames to the end of the data.
- When OLT receives business data or report frame of AF or business data or report frame to be sent in the first AB cycle, OLT allocates the required bandwidth to ONU according to the requirements of the report frame and assigns the corresponding bandwidth to the EF data that ONU is to send in the next cycle.
- The OLT will receive all of the service data. After reporting frame information through REPORT, the AF, BE service is summarized to determine if the system is in an overloaded state. Then we allocate the bandwidth required for the next cycle according to the improved DBA.

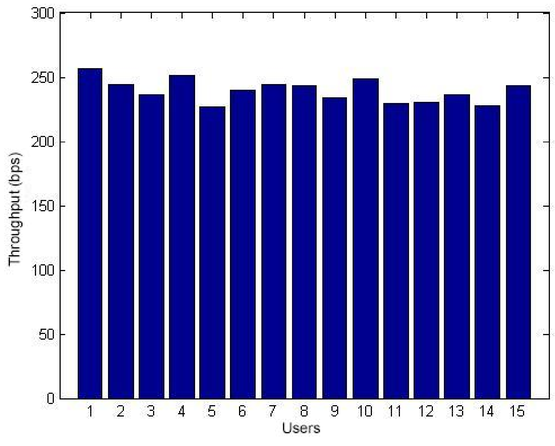
3. Results and discussion



▲Bandwidth Utilization



▲ System throughput changes with the load



▲ System throughput changes with the user

- The bandwidth utilization of the PON system always increases evenly as the business load increases, but when the system is on a heavy load, the utilization growth curve gradually slows down, and the bandwidth utilization generally shows the upward trend.The correlation properties are similar to random white noise and it is good for OCDMA system.
- The throughput of the system fluctuates with the increasing load.The number of frames is hourly, the curve changes rapidly, and the curve is relatively stable as the number of frames increases.
- The throughput is in a relatively stable state with the number of users, and the system throughput is in a good value and high utilization.

4. Conclusion

We analyzes the performance of improved DBA algorithm on MATLAB platform. The results show that the improved DBA can effectively improve the channel utilization and reduce the average time delay. Further research on DBA algorithms in PON systems will focus on further improvements in energy consumption, security, etc.

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