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in FiWi Access Networks

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# Improving User Throughput by Dynamically Selecting Gateway in FiWi Access Networks

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## 1. Introduction

Fiber-Wireless (FiWi) access network has become one of the most attractive research fields due to the advantages of Passive Optical Network (PON) and Wireless Local Area Network (WLAN) which are two main part of a FiWi network [1]. Since PONs in FiWi networks contribute large bandwidth for the backhaul partition, the limitations in traffic throughput only come from WLANs comprising gateways (GWs), access points (APs) and users, as shown in Fig. 1. This figure shows the problem of connecting all APs to their closest GWs in WLANs, which causes the unfairness between $GW_1$ and $GW_2$ because $GW_1$ has to service 10 users while $GW_2$ only need to provide network connection to 4 users. This motivates us to propose a gateway selection method to resolve the unfair problem in FiWi networks.

## 2. Proposed Gateway Selection Method

In our proposed method, when an AP wants to find its GW, it sends a connecting request message, which contains the total number of its users, to all GWs it can access. After receiving the message, each GW adds the number of users, which are currently under itself, to the message and forward it to the OLT. The OLT now has the information of GWs' service status and the number of users connecting to the requested AP. Thus, it can decide which GW should be connected to the AP so that the fairness between GWs can be improved. Since the number of users connecting to APs can be changed from time to time, this process is carried out periodically after every given time interval. By improving the fairness between GWs, user throughput will also improve because the congestion problem can be solved.

## 3. Performance Evaluation

In order to verify the effectiveness of our proposal, we conduct extensive simulations to compare the performance of the proposed method with that of the traditional method, which let APs connect to their closest GWs. In the simulation area of 400×400 $m^2$, 2 GWs and 10 APs are randomly placed. Users are uniformly distributed in the area and attempt to connect to their closest APs. The number of users is varied from 20 to 300. The simulation for each number of users is run with 100 different placements of users in order to find the average results. Fig. 2 demonstrates the performance of our proposed method in comparison with the traditional method. As shown in Fig. 2(a), although the minimum user throughputs in both methods has similar trend, where the throughput decreases with the increase of number of users, the throughput achieved in our proposed method always dominates the value in the traditional method. On the other hand, the contrast between the numbers of users

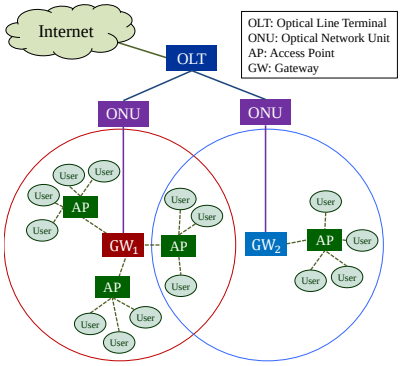
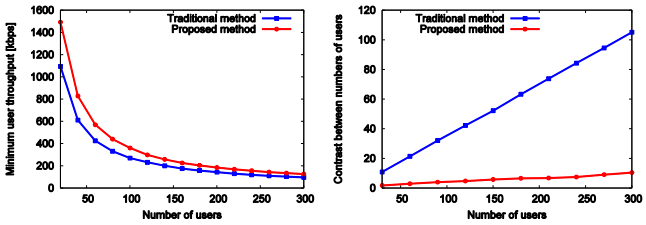



Fig. 1. Gateway selection problem in FiWi networks




(a) Minimum user throughput

(b) Contrast between numbers of users under two GWs

Fig. 2. Simulation based performance evaluation

under the two GWs is significantly smaller in our proposed method in any scenario. It means that the fairness is improved in our proposal when comparing with the traditional gateway selection method.

## 4. Conclusion

In this paper, we proposed a gateway selection method to improve the throughput of users and the fairness between GWs in FiWi access networks. The effectiveness of our proposal was verified by using simulations. The experiment results showed that our proposed method is superior to the traditional gateway selection method in terms of user throughput and fairness between GWs.

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## References

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