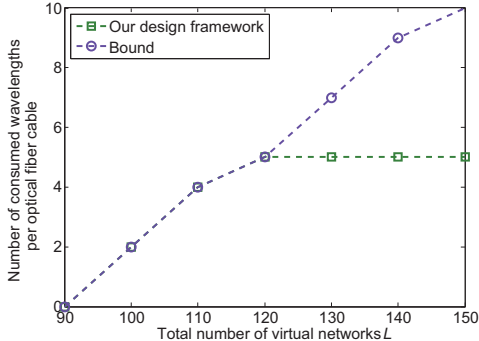
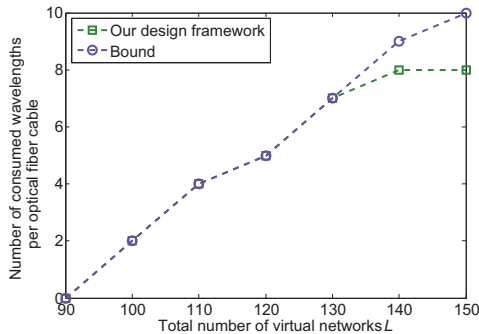
(a)  $SC_h = 15$ (b)  $SC_h = 20$ (c)  $SC_h = 25$ 

**Figure 8: Number of wavelengths per optical fiber cable vs. total number of virtual networks.**

framework and the optimal solution with  $SC_h = \{15, 20, 25\}$  in Figs. 8(a), 8(b), and 8(c), respectively. The number of wavelengths used by our design framework  $W$  becomes larger with an increasing value of  $L$ . With  $SC_h = 15$  in Fig. 8(a), only when  $L = 90$ , the converge ratio between  $W$  and the optimal solution  $W_{bound}$  is 100%. While in Fig. 8(a), the converge ratio decreases if  $L$  is larger than 90. This is because that we can not serve more virtual networks due to the limited computing resources of high-level EDs, even using the transformation of virtual networks. However, we can narrow the gap between  $W$  and  $W_{bound}$  if a higher  $SC_h$  is given. Given  $SC_h = 20$  in Fig. 8(b), when  $L = \{90, 100, 110, 120\}$ , the converge ratio is 100%. Given  $SC_h = 25$  in Fig. 8(c), when  $L = \{90, 100, 110, 120, 130\}$ , the converge ratio is always 100%. This demonstrates the optimality of our design framework.

## 5. CONCLUSION

We proposed a novel design framework to perform the green VNE of collaborative edge computing in environment-friendly optical-wireless networks. Simulation results demonstrated that our design framework could successfully embed more virtual networks compared to the benchmark with an average improvement ratio of 77%, while a blind increase of ED computing capacity could not improve the VNE efficiency; our algorithm showed a good converge ratio between the actual number of wavelengths used per optical fiber link and a theoretical optimal solution, especially with a high initial computing capacity of high-level EDs. Since our solution has a lower transmitting power and consumes fewer wavelengths, the corresponding design complies with the principles of social, economic and ecological sustainability.

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