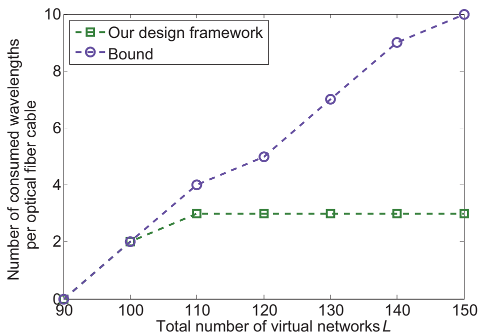
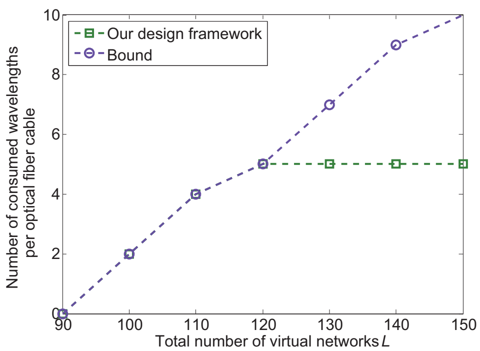
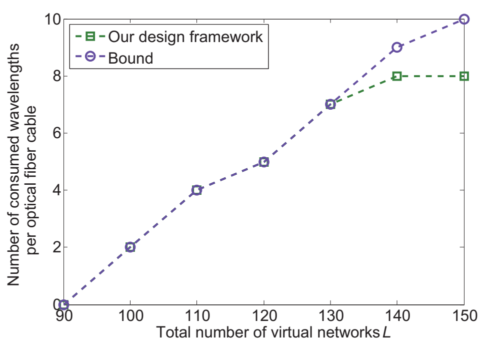


(a) $SC_h = 15$



(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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