Heuristic resource allocation algorithm for controller placement in multi-control 5G based on SDN/NFV architecture

ABSTRACT

The integration of Software Defined Networking (SDN) and Network Function Virtualization (NFV) is considered to be an efficient solution that enables the forecasting of highly scalable, optimal performance of 5G networks by providing an effective means of network functionality. The distributed multi-controller architecture approach is an emerging strategy that primarily aims to support network functions performed through the application of a control plane, to provide versatile network traffic management. However, the management of resource allocations across multiple data centers is an important issue that still affects 5G core networks. Using such a strategy in 5G core networks requires the controllers to be correctly located, in order to improve network reliability and cost-effectiveness. Thus, to address the controller placement problem (CPP) in a distributed 5G network, we proposed an efficient, heuristic multi-objective optimization approach, using dynamic capacitated controller placement problem (DCCPP). It is based on the K-center problem, to solve the capacitated controller placement problem (CCPP), which acts as a resource location problem, in which the location and number of controllers can be allocated to maximize resources. A Greedy Randomized Search (GRS) algorithm was used to solve the dynamic assignment of nodes to controllers to achieve load balancing. The design of the heuristic method provides proper load balancing, efficient cost management, and network resource management, as compared to the basic CCPP model. The results indicate that the allocation and the optimum number of controllers under an effective decentralized policy could achieve a higher degree of efficiency through resource assignment in such a densified network.

Keyword: 5G; SDN; Controller placement problem; Resource assignment; Heuristic; Optimization