

Detection and classification of conflict flows in SDN using machine learning algorithms

ABSTRACT

Software-Defined Networking (SDN) is a new type of technology that embraces high flexibility and adaptability. The applications in SDN have the ability to manage and control networks while ensuring load balancing, access control, and routing. These are considered the most significant benefits of SDN. However, SDN can be influenced by several types of conflicting flows which may lead to deterioration in network performance in terms of efficiency and optimisation. Besides, SDN conflicts occur due to the impact and adjustment of certain features such as priority and action. Moreover, applying machine learning algorithms in the identification and classification of conflicting flows has limitations. As a result, this paper presents several machine learning algorithms that include Decision Tree (DT), Support Vector Machine (SVM), Extremely Fast Decision Tree (EFDT) and Hybrid (DT-SVM) for detecting and classifying conflicting flows in SDNs. The EFDT and hybrid DT-SVM algorithms were designed and deployed based on DT and SVM algorithms to achieve improved performance. Using a range of flows from 1000 to 100000 with an increment of 10000 flows per step in two network topologies namely, Fat Tree and Simple Tree Topologies, that were created using the Mininet simulator and connected to the Ryu controller, the performance of the proposed algorithms was evaluated for efficiency and effectiveness across a variety of evaluation metrics. The experimental results of the detection of conflict flows show that the DT and SVM algorithms achieve accuracies of 99.27% and 98.53% respectively while the EFDT and hybrid DT-SVM algorithms achieve respective accuracies of 99.49% and 99.27%. In addition, the proposed EFDT algorithm achieves 95.73% accuracy on the task of classification between conflict flow types. The proposed EFDT and hybrid DT-SVM algorithms show a high capability of SDN applications to offer fast detection and classification of conflict flows