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Mobile Fog Computing by Using SDN/NFV on 5G Edge Nodes

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Abstract: Fog computing provides quality of service for cloud infrastructure. As the data computation intensifies, edge computing becomes difficult. Therefore, mobile fog computing is used for reducing traffic and the time for data computation in the network. In previous studies, software-defined networking (SDN) and network functions virtualization (NFV) were used separately in edge computing. Current industrial and academic research is tackling to integrate SDN and NFV in different environments to address the challenges in performance, reliability, and scalability. SDN/NFV is still in development. The traditional Internet of things (IoT) data analysis system is only based on a linear and time-variant system that needs an IoT data system with a high-precision model. This paper proposes a combined architecture of SDN and NFV on an edge node server for IoT devices to reduce the computational complexity in cloud-based fog computing. SDN provides a generalization structure of the forwarding plane, which is separated from the control plane. Meanwhile, NFV concentrates on virtualization by combining the forwarding model with virtual network functions (VNFs) as a single or chain of VNFs, which leads to interoperability and consistency. The orchestrator layer in the proposed software-defined NFV is responsible for handling real-time tasks by using an edge node server through the SDN controller via four actions: task creation, modification, operation, and completion. Our proposed architecture is simulated on the EstiNet simulator, and total time delay, reliability, and satisfaction are used as evaluation parameters. The simulation results are compared with the results of existing architectures, such as software-defined unified virtual monitoring function and ASTP, to analyze the performance of the proposed architecture. The analysis results indicate that our proposed architecture achieves better performance in terms of total time delay (1800 s for 200 IoT devices), reliability (90%), and satisfaction (90%).

Keywords: Mobile fog computing; edge computing; edge node; IoT; software-defined networking; network functions virtualization; orchestrator



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