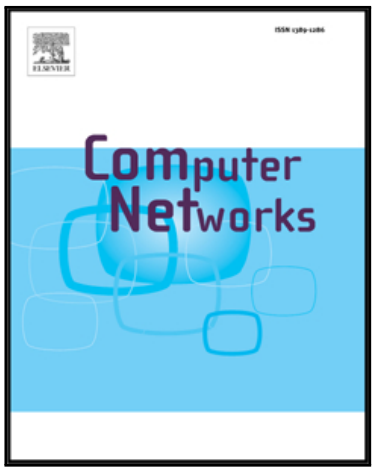

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Abstract

The emergence of Network Functions Virtualization (NFV) is bringing a set of novel algorithmic challenges in the operation of communication networks. NFV introduces volatility in the management of network functions, which can be dynamically orchestrated, i.e., placed, resized, etc. Virtual Network Functions (VNFs) can belong to VNF chains, where nodes in a chain can serve multiple demands coming from the network edges. In this paper, we formally define the VNF placement and routing (VNF-PR) problem, proposing a versatile linear programming formulation that is able to accommodate specific features and constraints of NFV infrastructures, and that is substantially different from existing virtual network embedding formulations in the state of the art. We also design a math-heuristic able to scale with multiple objectives and large instances. By extensive simulations, we draw conclusions on the trade-off achievable between classical traffic engineering (TE) and NFV infrastructure efficiency goals, evaluating both Internet access and Virtual Private Network (VPN) demands. We do also quantitatively compare the performance of our VNF-PR heuristic with the classical Virtual Network Embedding (VNE) approach proposed for NFV orchestration, showing the computational differences, and how our approach can provide a more stable and closer-to-optimum solution.

Keywords: Network Functions Virtualization, VNF orchestration, VNF

[☆] A preliminary version of this paper appeared in [1].

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