Editorial

Design of High Throughput and Cost-Efficient Data Center Networks Supporting NFV

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Received 20 April 2016; Accepted 20 April 2016

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Data centers (DC) are characterized by the sharing of compute and storage resources to support Internet services. Today, many companies (Amazon, Google, Facebook, etc.) use data centers to offer storage, web search, and large-computations services with multibillion dollars business. The servers are interconnected by elements (switches, routers, interconnection systems, etc.) of a network platform that is referred to as Data Center Network (DCN).

Network Function Virtualization (NFV) technology introduced by European Telecommunications Standards Institute (ETSI) applies the cloud computing techniques in the telecommunication field allowing for a virtualization of the network functions to be executed on software modules running in data centers. Any network service is represented by a Service Function Chain (SFC) that is a set of VNFs to be executed according to a given order. The running of VNFs needs the instantiation of VNF instances (VNFI) that in general are software modules executed on virtual machines.

The support of NFV needs high performance servers due to higher requirements by the network services with respect to classical cloud applications.

The purpose of this special issue is to study and evaluate new solution for the support of NFV technology.

The special issue consists of four papers whose brief summaries are listed below.

“Server Resource Dimensioning and Routing of Service Function Chain in NFV Network Architectures” by V. Eramo et al. focuses on the resource dimensioning and SFC routing problems in NFV architecture. The objective of the problem is to minimize the number of SFCs dropped. The authors formulate the optimization problem and due to its NP-hard complexity, heuristics are proposed for both cases of offline and online traffic demand.

“A Game for Energy-Aware Allocation of Virtualized Network Functions” by R. Bruschi et al. presents and evaluates an energy-aware game theory based solution for resource allocation of Virtualized Network Functions (VNFs) within NFV environments. The authors consider each VNF as a player of the problem that competes for the physical network node capacity pool, seeking the minimization of individual cost functions. The physical network nodes dynamically adjust their processing capacity according to the incoming workload flows, by means of an Adaptive Rate strategy that aims at minimizing the product of energy consumption and processing delay.

“A Processor-Sharing Scheduling Strategy for NFV Nodes” by G. Faraci et al. focuses on the allocation strategies of processing resources to the virtual machines running the VNF. The main contribution of the paper is the definition of a processor-sharing policy, referred to as Network-Aware

Round Robin (NARR). The proposed strategy dynamically changes the slices of the CPU assigned to each VNF according to the state of the output network interface card queues. In order to not waste output link bandwidth, more processing resources are assigned to the VNF whose packets are addressed towards the least loaded output NIC.

“Virtual Networking Performance in OpenStack Platform for Network Function Virtualization” by F. Callegati et al. evaluates the performance evaluation of an Open Source Virtual Infrastructure Manager (VIM) as OpenStack focusing in particular on packet forwarding performance issues. A set of experiments are presented that refer to a number of scenarios inspired by the cloud computing and NFV paradigms, considering both single- and multitenant scenarios.

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