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Special track
SDNNFV: Control, Scalability and Performance

Editorial

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Abstract — **Software Defined Networking (SDN) and Network Function Virtualization (NFV) are recent and complementary technologies, offering novel capabilities and features for the Future Internet and various areas of IT, networking and services. Industry, academia, research groups, standardization organizations, operators, enterprises, etc., are active in developing architectures, investigating, designing, developing and deploying SDN/NFV solutions in different contexts. However many still open issues exist in both SDN and NFV areas, related to various aspects starting from concepts and architectures, SDN/NFV cooperation, continuing down to specific implementation and exploitation problems. The SDNNFV special track, inside the SOFTNETWORKING 2017 Symposium has been focused (but not limited) on control, scalability and performances topics in SDN/NFV systems. Several contributions have been presented in the session.**

Keywords — Software defined networking; Network function virtualization; control plane.

I. INTRODUCTION

Today, it is widely recognized that Software Defined Networking (SDN) and Network Function Virtualization (NFV) are two powerful and complementary (they can be seen as being partially - orthogonal) technologies, promising a lot of attractive features for the Future Internet, in various areas of IT, like cloud computing, networking and services, [1][2][3]. Major industry actors, operators, enterprises, standardization bodies and also academia, research groups, etc., are involved and active in investigating, designing, developing and deploying SDN/NFV solutions in different contexts. Standardization organizations and forums (ONF, ETSI, NIST, IEEE, ISO, etc.) are recently making synergic efforts in defining use cases for various domains, requirements, specifications and architectures, design guidelines, etc. and harmonizing their views.

However, many still open issues exist in both SDN and NFV areas, related to various aspects, starting from concepts and architectures and going down to specific implementation and exploitation problems. Backward compatibility and interoperability with legacy systems are also important. While SDN offers important advantages of programmability capabilities, flexibility, abstraction and independency on equipment vendors, its centralization and control/data planes separation principles raise issues on control and management architectures, scalability, reliability, security, real-time response and others. NFV technology aims to improve the efficiency and flexibility versus traditional networking (based on dedicated hardware/software boxes) solutions, by using COTS hardware and switches, supporting Virtualized Network Functions (VNFs) realized through software virtualization techniques. Among NFV challenges one can mention: coexistence in cloud-integrated hybrid environments, real-time performance, managing the abstraction, scalability, process realignment so that traditional and virtual infrastructures can be managed together and so on.

Specific topics of the SDNNFV special track topics included: management and control architectures, performance evaluation, reliability, security and trust, optimization and isolation of the data and control planes, implementation aspects, SDN/NFV cooperation topics, NFV service chaining, use cases in fixed and mobile network contexts and so on.

II. SDNNFV SPECIAL TRACK - CONTRIBUTIONS

The first paper of the SDNNFV special track has been "NFV Information Model Extensions for Improved Reliability and Lifecycle Management" (*Giovanni Fausto Andreotti, Paolo Secondo Crosta, Emanuele Miucci, Giuseppe Monteleone*- Italtel, Italy), [4]. It is focused on improvements in management and orchestration within the NFV domain. The key benefits of the approach are related to automation in the Virtual Network Function (VNF) lifecycle, adaptation to different network traffic loads and new models for improving network resilience. These could be achieved by introducing some extensions of the NFV Information Model. Firstly, it is proposed to introduce in the VNF, a Descriptor (VNFD) of an Information Element, providing the dependencies between Virtual Deployment Units (VDUs),

that allows managing the VDUs' instantiation process in a more efficient way. Secondly, an extension is suggested related to the execution of script(s) - including the possibility to pass parameters - in response to particular events detected by the VNF Manager (VNFM). Finally, a new Information Element is proposed to describe high availability features, thus defining possible redundancy schemes that allow the execution of specific operations tailored for each single instance of the VNF. The validation of the proposal is illustrated by giving some practical examples, based on a real implementation of a VNF-based Session Border Controller.

The second paper has been "GPU-accelerated Video Transcoding Unit for Multi-access Edge Computing Scenarios" (*Antonino Albanese, Paolo Secondo Crosta, Claudio Meani, Pietro Paglierani*- Italtel, Italy)[5].The motivation of the work is related to the exponential growth of video traffic and the outburst of novel video-based services, which are inadequately served by the traditional mobile network infrastructures. To respond to this and to many other demands coming from today's society, the 5G and the Multi-access Edge Computing (MEC) initiatives are proposing novel network architectures. In this context, this paper develops a Video Transcoding Unit (VTU) application, which, leveraging on MEC principles, brings several functionalities to the edge of networks, greatly improving User Experience with mobile terminals. The VTU can be implemented as a SW (Software)-only Virtual Network Function, or be accelerated by a Graphics Processing Unit (GPU). Specific tests are described and discussed, showing the clear superiority of the HW (Hardware)-accelerated implementation in terms of computing performance and efficiency. A possible use case is presented, in which the VTU is used in a Stadium or in large public venues during crowded events like a sporting match or concerts. The work presented in this paper was undertaken under the EU Horizon 2020 Sesame Project.

The third contribution has been „Combined NFV and SDN Applications for Mitigation of Cyber-attacks Conducted by Botnets in 5G Mobile Networks", (*Giacomo Bernini, Pietro Giuseppe Giardina, Gino Carrozzo*- Nextworks, Italy, *Alberto Huertas Celdran, Manuel Gil Perez* - University of Murcia, Spain, *Jose M. Alcaraz Calero, Qi Wang*- University of the West of Scotland, UK, *Konstantinos Koutsopoulos* - Creative Systems Engineering, Athens, Greece, *Pedro Neves* - Altice Labs, Aveiro, Portugal) [6]. It is observed that 5G networks are envisioned to support substantially more users than the current 4G. This has as a direct consequence of the anticipated large diffusion of Machine-2-Machine (M2M) and Internet of Things (IoT) interconnected devices, often with significantly higher committed data rates than general bandwidth currently available into Long Term Evolution (LTE) and broadband networks. The expected large number of 5G subscribers will offer new opportunities to compromise devices and user services, which will allow attackers to trigger much larger and effective cyber-attacks. Significant advances in network management automation are therefore needed to manage 5G networks and services in an efficient, scalable, and effective way while protecting users and infrastructures from a wide plethora of advanced security threats. This paper presents a novel self-organized network management approach for 5G mobile networks where autonomic capabilities are tightly combined with Network Functions Virtualization (NFV) and Software-Defined Networking (SDN) technologies so as to provide an effective detection and mitigation of cyber-attacks.

III. CONCLUSIONS

Three solid works have been submitted and presented in the SDNNFV session. The special track has given opportunity for fruitful and interesting discussions and exchange of experience on various aspects related to both SDN and NFV technologies.

As guest editors, we would like to thank all the authors for their valuable submissions to SDNNFV special track. We are also grateful to the reviewers who contributed to improve the quality of articles. Also, many thanks to IARIA board and logistic teams who made this event possible. Finally, we hope that at next year NexComm 2018 event, novel contributions related to SDN/NFV areas will appear.

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