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Globecom 2018 Workshop ACPSN

Thursday Dec 13, 2018 – Abu Dhabi, UAE

1st International Workshop on

Advanced Control Planes for Software Networks

– Toward Plug 'n Play Software-Defined Infrastructures –

In networking research and development there is a clear trend toward the creation and provisioning of more flexible network infrastructures. Emerging enabling technologies such as Software-defined Networking, Network Function Virtualization, Service Function Chaining, and the envisioned Network Slicing in 5G networks are evidence for future software-based infrastructures offering such flexibility. By introducing software and IT principles in networking, these technologies promise an easier, faster and better adaptability to changing needs of future network services as well as overall cost savings. Despite the strong recent research interest for these areas, there are still challenges ahead to unfold the full potential of software-based network infrastructures. One aspect is the higher dynamics of such software-defined infrastructures directly related to the promise of flexibility: instead of a rather static and detailed pre-planning of the (mostly) virtual network infrastructure, the infrastructure should be elastic, i.e., enlarge or shrink as needed on-demand. Thus, one can expect that scaling happens on much shorter timescales than considered before (e.g., minutes rather than days). This could ease the development of network services: starting from an initial network configuration, a so-called slice could be adapted to the current needs without strict and conservative pre-planning. Network providers could offer cost-effective solutions due to the potential statistical multiplex gain on the actual resources.

We currently witness a concrete demand for this coming from the 5G core network modularization and virtualization. If, for example, many 5G control plane components are realized as virtual network functions (VNF), one can assume that these are scaled up horizontally, when the load in the network grows. Similarly, in SDN-based networks the SDN control plane must be able to scale with a growing demand from the data plane. In contrast, current SDN and NFV solutions assume the existence of a separate fixed control infrastructure. This is a serious scaling limitation in the architecture for virtual components (e.g., if the SDN-controlled switches are also virtual) that could be overcome by using virtual control channels and virtual control end-points. Therefore, we envision a flexible network infrastructure that is not only able to provide scalability at different service levels (e.g., data plane, SDN/NFV control plane, 5G control plane), but also to adapt and self-organize itself, i.e. its own control plane. For example, if the SDN control channels are sharing the infrastructure with the data plane channels ("in-band control"), the control must be resilient to self-inflicted node and link failures caused by SDN control actions (e.g., cutting of an SDN-controlled switch from SDN controller(s) by closing down a port or redirecting control flows in a loop).

Prior network virtualization research addressed the problem of virtual network embedding, i.e. efficient or optimized mapping of the virtual resources onto the physical network infrastructure resources. Similarly, the current approach of network slicing in 5G considers that slice instances are made from so-called "network slice blueprints", which define the layout and requirements of the virtual 5G network. However, since adaptivity on shorter timescales is desirable to reduce the total cost of ownership (TCO), it will result in a shift from a more static mapping of virtual resources onto physical resources toward virtual resource scheduling within the physical infrastructure. This is a complex task, since it requires consideration of dependencies between computational resources (VNFs), network resources (virtual switches/routers and links) as well as storage resources (file storage, data bases, etc.). Similar approaches from the orchestration area are unfortunately positioned on the management plane, and cannot cope with the events occurring in runtime.

In summary, the current approaches toward software-based network infrastructures are not yet ready to unleash the full power of the software-based paradigm, as it is already used within data centers. Higher adaptivity and elasticity requirements challenge not only control plane mechanisms, but also the achievable quality of control and finally the attainable quality of service. More research is needed in these directions.

In this context, several challenges can be identified:

- Moving away from infrastructure pre-planning toward really elastic network slices that can handle high dynamics
- Elasticity of control and management to support elasticity of network slicing
- Achieving consistent control of all involved slice resources across different resource domains (wireless access, aggregation, core, compute, network, and storage resources)
- Assessing flexible control plane design alternatives, e.g., in-band control versus separate data plane and control slices
- Handling aspects of nested SDN control and network virtualization (e.g., running SDN and NFV inside a network slice)
- Providing reliable tenant access to control plane functions for the virtualized network infrastructure

The workshop will provide a frame to discuss challenges and first research works along this problem space. The workshop chairs and TPC chairs solicit original, unpublished technical papers in the area of (but not limited to):

- Distributed, autonomous, and self-organizing SDN control and management planes
- Scaling concepts for elastic network slices
- Elasticity of control and management to support elasticity of network slicing
- Virtual network resource scheduling (rather than virtual network embedding schemes)
- Robust SDN in-band control channels
- Out-of-VNet-control Interfaces: how to request instantiation, deletion, and runtime changes of a network slice
- Partitioning and aggregation concepts for control plane resources (e.g., SDN controller, virtualized infrastructure manager, etc.)

The workshop also explicitly welcomes research work in early stages, presenting problem statements and first concepts, e.g., without comprehensive evaluation but preliminary results. Such contributions can be submitted as short papers (3 pages). The Globecom Author and Submission Guidelines (http://globecom2018.ieee-globecom.org/authors/call-symposium-papers#asg) apply. All submissions should be written in English with a **maximum paper length of six (6) printed pages** (10-point font) including figures without incurring additional page charges (maximum 1 additional page with over length page charge of USD100 if accepted). Papers exceeding 7 pages will not be accepted at EDAS. Standard IEEE conference templates for LaTeX formats are found at here: http://www.ieee.org/conferences_events/conferences/publishing/templates.html

You may also use one of the following templates for Microsoft Word: A4, US letter. Only PDF files will be accepted for the review process, and **all submissions must be done through EDAS**. Accepted Papers will be published in the GLOBECOM2018 Workshops Proceedings and submitted to IEEE Xplore.

Important Dates

- Registration for paper submission: July 14th, 2018
- Deadline for paper submission: **July 14th (FIRM!)**, 2018
- Acceptance notification: **August 15th**, 2018
- Final workshop papers due: **September 15th**, 2018

Exact deadline times are as displayed in EDAS (usually 23:59:59 EDT).

Please find more information at the workshop site: https://tm.kit.edu/events/gc2018-ws-acpsn

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