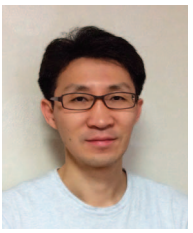
NEW ERA SOFTWARE DEFINED NETWORK


Bi Jun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Software-Defined Networking (SDN) is now considered as one of the promising future networking technologies, and this trend can be clearly verified by observing activities of both industry and academia. In industry, we can easily notice that many major network vendors, such as Cisco and Juniper, are actively supporting SDN functionalities. In addition, several network service provides have deployed SDN enabled networks in their services (e.g., Google B4 and Microsoft SWAN). This trend can also be noticeable in academia. Recently, many SDN related research outputs have been published and announced at diverse top tier networking venues (e.g., SIGCOMM, CoNEXT, and NSDI). As such, SDN is now a key player in networking, and thus it is clear that we, researchers, should put more attention on this area.

This Feature Topic Issue contains a collection of papers that will provide both theoretical advances and practical experiences for SDN, covering topics ranging from SD architecture, data plan, and specific scenarios such as the data center and carrier grade Wi-Fi environment.

The first article, "*Optimizing the Resource Utilization of Datacenter Networks with OpenFlow*", is authored by LIU Bo, *et al.*, proposes an OpenFlow based MultiPath Cooperation framework, called OFMPC, to decrease the flow completion time as well as increase the network throughput. OFMPC partitions the end-to-end paths into two classes, i.e., low delay paths (LDPs) and high throughput paths (HTPs). Short flows are assigned to LDPs to avoid long queueing delay, while long flows are assigned to HTPs to guarantee their throughput. The paper also introduces a dynamic scheduling mechanism to improve network efficiency.

The second article, "*SWN: An SDN Based Framework for Carrier Grade Wi-Fi Networks*", by LEI Tao, *et al.*, studies an interesting SDN scenario, which is the SDN based carrier grade Wi-Fi network framework SWN. In SWN, the control plane has a centralized global view of the whole network situation, while the data plane abstracts the connection between user equipment (UE) and access point (AP). The network operators can design network applications by using APIs and the SAP abstraction to construct a carrier grade Wi-Fi network.

The third article, by MA Haiyan, *et. al.*, is titled "*Towards SDN Based Queuing Delay Estimation*", and studies the issue of SDN based queuing delay estimation. This paper proposes a queuing estimation model and extends it for end-to-end delay of the whole path. Authors also conduct the evaluation with a simulation tool Mininet and implement the dynamic delay control as a SDN application.

The fourth article, by GAO Xianming, *et. al.*, studies the data plane of a generalized SDN network device. In particular, as the title of the paper, "*A High-Elasticity*

Router Architecture with Software Data Plane and Flow Switching Plane Separation" indicates, authors propose an alternative router architecture in which a forwarding plane is separated into a software data plane (SDP) for packet processing and a flow switching plane for packet receiving/transmitting/switching. Each plane can be regarded as a collection of "building blocks" for a defined-able router. This paper also makes use of network fabrics to define the connectivity among building blocks.

The last article, "*SDICN: A Software Defined Deployable Framework of Information Centric Networking*", by WANG Xiulei, *et. al.*, studies an interesting topic: the combination of SDN with a new network architecture ICN. In particular, the paper proposes SDNICN, which is a framework using SDN technology to facilitate the deployment of new ICN network paradigm without disrupting production traffic by decoupling the control plane from data forwarding plane. The paper also presents a prototype of SDICN implementation and compares the performance with the CCNx.

The guest editors thank all of the authors for their submissions to this Feature Topic Issue. We are also grateful to the anonymous reviewers for their timely responses and their valuable comments to improve the quality of the articles. We hope that this Feature Topic Issue will further stimulate research interests in the significant research area of Software Defined Networking.

Biographies

BI Jun, received B.S., M.S., and Ph.D. degrees in computer science from Tsinghua University, China. He was a postdoctoral scholar at Bell Laboratories Research and a research scientist at Bell Labs, USA. Currently he is a full professor and director of Network Architecture Research Division, Institute for Network Sciences and Cyberspace at Tsinghua University. His research interests include Internet Architecture and Protocols. He published papers in the top journal and conferences, such as TON, ICNP, etc. He is the Chair of AsiaFI (Asia Future Internet Forum) Steering Group, and co-founder of China SDN Commission and serves as Executive Chair. He served as Co-Chairs of workshops/Tracks at INFOCOM, ICNP, Mobihoc, ICCCN, etc., and served on Organization Committee or Technical Program Committees at SIGCOMM, ICNP, INFOCOM, CoNEXT, SOSR/HotSDN, etc. He is a senior member of IEEE, a senior member of ACM, a distinguished member of CCF (China Computer Federation), and a senior member of CIC (China Institute of Communications).

Seungwon Shin, received the Ph.D. degree in computer engineering from the Electrical and Computer Engineering Department, Texas A&M University (Advisor, Prof. G. Gu and Prof. A. L. Narasimha Reddy). He received his M.S degree and B.S degree in electrical and computer engineering from KAIST. He is currently an Assistant Professor with the School of Computing, KAIST. Before joining KAIST, he has spent nine years at industry, where he devised several mission critical networking systems. He is currently a Research Associate of Open Networking Foundation (ONF), and a member of security working group at ONF. His research interests span the areas of Software Defined Networking (SDN) security, IoT (Inter of Things) security, and Botnet analysis/detection. A common thread in his research is in revealing/ understanding network threats and designing new systems/algorithms for making networked system secure. He has conducted several SDN security projects to make SDN environments more secure (e.g., FRESCO, FortNOX, and Avant-Guard) and their outputs have been published at top-tier networking/security conferences, such as ACM CCS, NDSS, and SIGCOMM-HotSDN.

Kai Chen, is an Assistant Professor with Department of Computer Science and Engineering, Hong Kong University of Science and Technology. He received his PhD in Computer Science from Northwestern University, Evanston IL in 2012. His research interests include networked systems design and implementation, data center networks, and cloud and big data systems. His work has been published in various top venues such as SIGCOMM, NSDI, IEEE/ACM ToN, etc. He is interested in finding simple yet practical solutions to real-world networking systems problems.