J Netw Syst Manage (2015) 23:249–251
DOI 10.1007/s10922-014-9339-z

GUEST EDITORIAL

JONS: Special Issue on Management of Software-Defined Networks

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Received: 20 December 2014 / Accepted: 22 December 2014 / Published online: 10 February 2015

Software Defined Networking attempts to use software defined packages or modules for implementing network features/functions and their control and management. It utilizes the concept of separating the network control plane from the network traffic forwarding plane. The control plane can be physically distributed, but it is logically centralized. SDN decouples the physical networking infrastructure/resources from the services that utilize them so that flexibility and programmability in a resources' assignment can be achieved seamlessly for the desired applications and services. However, there are a number of network management issues to be explored as to how developers and engineers should design, build, and manage networks from the existing networks, and what and how new functionalities can be offered.

We received a large number of submissions from seven different countries. We have gone through a rigorous review process and all the papers received at least two reviews. Ultimately, we selected five papers from the open call, and an invited paper from the industry. This special issue covers a wide scope of SDN management including a transport network, a broader abstraction platform, a hybrid architecture with a legacy network, a multi-domain architecture, multicast, and end-host management. Some of them are near or already at the operational/deployment stage.

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The paper "Software-Defined Multicast for Over-the-Top and Overlay-based Live Streaming in ISP Networks" by J. Rückert, J. Blendin, and D. Hausheer proposes a software-defined multicast to improve residential broadband ISP's traffic efficiency for large peer-to-peer (P2P) live streaming data that is often hard to predict and control. It uses the ONF's OpenFlow based multicast service and a concept of a virtual peer that allow an external streaming source to take a virtual presence inside an ISP network as a generic network layer proxy.

The paper "Towards A Network Abstraction Model for SDN" by E. Haleplidis, J. H. Salim, S. Denazis, and O. Koufopavlou explains the backgrounds and relation between SDN and NFV (Network Function Virtualization). It proposes a unifying common network abstraction model for both forwarding and network functions where NFV is able to a create virtual network infrastructure and SDN is capable of configuring them. Then each device can be accessed by a controller or NF manager through appropriate APIs.

The paper "FlowBroker: A Software-Defined Network Controller Architecture for Multi-Domain Load Balancing and Reputation" by D. Marconett and S. J. B. Yoo addresses the issues of scale and inter-domain forwarding and management in a large SDN deployment scenario using a broker architecture. Broker agents aggregate network states, compute efficient inter-domain forwarding paths, and periodically recommend updated disjoint inter-domain paths for load balancing. Then each controller uses a machine learning based agent to determine a better performing and reputed broker. The FlowBroker is used to provide a cooperative and scalable approach to multi-domain flow management in SDNs.

The paper "Providing Optical Network as a Service with Policy-based Transport SDN", by M. Siqueira, F. Hooft, J. Oliveira, E. Madeira, and C. Rothenberg discusses a policy-based mechanism in a transport SDN controller that supports optical network virtualization. The authors then demonstrate the experiment results of a few optical transport SDN applications as use cases, including dynamic virtual optical network configuration and restoration and optical equalization of local policy.

The paper "HONE: Joint Host-Network Traffic Management in Software-Defined Networks" by P. Sun, M. Yu, M. Freedman, J. Rexford, and D. Walker presents a programmable platform of traffic management for both end-hosts and network devices. The authors argue that involving end-hosts in traffic measurement can provide rich contexts of application and transport layers and their interaction with network devices. HONE agents perform monitoring and analysis of measurement data in a programmable manner.

The invited paper "IRIS-CoMan: Scalable and Reliable Control and Management Architecture for SDN-enabled Large-scale Networks" by T. Choi, B. Lee, S. Kang, S. Song, H. Park, S. Yoon, and S. Yang presents a hybrid architecture of SDN-based agent servers and legacy device-based switches for efficient network monitoring, control, and management. IRIS is the authors' OpenFlow based SDN controller, and IRIS-CoMan agents include IRIS controllers, an IRIS Software-defined Virtual Monitoring Function (IRIS-SuVMF), and a Virtual Network Management System (vNMS). It presents the design, implementation, deployment, and evaluation results of IRIS-CoMan.

We hope that the readers take pleasure in reading the papers in this special issue, and find these articles informative and inspiring. Our highest appreciation goes to

the anonymous reviewers for offering their valuable time and expertise. We, the editors give our special gratitude to the JNMS Editor-in-Chief and the Springer staff for their valuable suggestions, guidance, and help.

Bhumip Khasnabish Ph.D. (Electrical Engineering, UW, Canada), AMCPM (GWU, USA) is a senior member of the IEEE and an emeritus distinguished lecturer of the IEEE Communications Society. He initiated cloud and data center activities in IETF and is vice-chair of DMTF NSM WG. He previously co-chaired the ATIS IPTV Interoperability Forum (IIF), and founded and chaired ATIS NG-CI TF and MSF Services WG. He is currently a senior director in the Strategy Planning and Standards Development Department of ZTE (TX) Inc., a division of ZTE Corporation. Previously he worked in (1) BNR Ltd. (1992–1995) in Ottawa, Canada, and (2) GTE and then Verizon Labs. (1995–2009) in Waltham, MA, USA. His research activities are focused on platforms and services that use virtualized computing, communication, and storage entities. Other areas of interest include smart body sensors, tighter cross-layer communications, software-defined networking, and system configuration/service automation. Dr. Khasnabish has authored numerous articles, book chapters, books, and patents (27 issued by the USPTO as of December 2014) in his research areas. He contributed chapters to IEEE Vision for Smart Grid Communications: 2030 and Beyond (IEEE, May 2013), Next Generation Telecommunications Networks, Services, and Management (Wiley-IEEE, March 2010), Multimedia Networking: Technology, Management and Applications (IGI Books, July 2001), and Enterprise Networking: Multilayer Switching and Applications (IGI Books, July 2001). His book, Implementing Voice over IP (Wiley-IEEE, 2003) has multiple printed editions. Dr. Khasnabish has co-edited Multimedia Communications Networks: Technologies and Services (Artech House, 1998) and many special issues of IEEE Network, IEEE Wireless Communications, IEEE Communications, and the Journal of Network and Systems Management.

Baek-Young Choi is an Associate Professor in the Department of Computer Science Electrical Engineering at the University of Missouri - Kansas City. She received her Ph.D. in Computer Science and Engineering from the University of Minnesota, Twin Cities. She held positions at Sprint Advanced Technology Labs, and the University of Minnesota, Duluth, as a post-doctoral researcher, and as a 3M McKnight distinguished visiting assistant professor, respectively. She has been a fellow of the U.S. Air Force Research Laboratory's Visiting Faculty Research Program (AFRL-VFRP), and Korea Telecom - Advance Institute of Technology (KT-AIT). Her research interests lie in the broad area of algorithm and system development for diverse types of networks, especially in resource management and network monitoring. She has authored the book, 'Scalable Network Monitoring in High Speed Networks', and co-edited the book, 'High Performance Cloud Auditing and Applications'. She has served on NSF and DOE panels multiple times and is currently an Associate Editor for the Elsevier Journal of Computer Networks and the Springer Journal of Telecommunication Systems. She has also served as a general chair, technical program chair, technical program committee member, organizing committee member, session chair, and reviewer for many international conferences and workshops. Her research has been supported by several agencies including NSF, Sprint-Nextel, AFRL, University of Missouri System, and UMKC. She is a senior member of ACM and IEEE, and a member of IEEE Women in Engineering.

Nick Feamster is a professor in the Computer Science Department at Princeton University. Before joining the faculty at Princeton, he was a professor in the School of Computer Science at Georgia Tech. He received his Ph.D. in Computer Science from MIT in 2005, and his S.B. and M.Eng. degrees in Electrical Engineering and Computer Science from MIT in 2000 and 2001, respectively. His research focuses on many aspects of computer networking and networked systems, with a focus on network operations, network security, and censorship-resistant communication systems. In December 2008, he received the Presidential Early Career Award for Scientists and Engineers (PECASE) for his contributions to cybersecurity, notably spam filtering. His honors include the Technology Review 35 "Top Young Innovators Under 35" award, the ACM SIGCOMM Rising Star Award, a Sloan Research Fellowship, the NSF CAREER award, the IBM Faculty Fellowship, the IRTF Applied Networking Research Prize, and award papers at the SIGCOMM Internet Measurement Conference (measuring Web performance bottlenecks), SIGCOMM (network-level behavior of spammers), the NSDI conference (fault detection in router configuration), Usenix Security (circumventing web censorship using Infranet), and Usenix Security (web cookie analysis).