Integrating Application-Aware Virtualized Network Functions in Software-Defined Infrastructure/Exchanges

Zhi-Li Zhang (zhzhang@cs.umn.edu)

Dept. of Computer Science & Engineering, University of Minnesota

My Interest and Research in SDN and Possible Contribution to the Workshop. My students and I have been conducting research in software-defined networking and related areas in the past few years. In particular, we are currently conducting research on addressing challenges in reconciling and integrating software-defined networking (SDN) and network function virtualization (NFV) – two major trends that are rapidly altering and re-shaping the landscape of large enterprise networks. We have proposed and developed a new SDN data plane architecture, NEWS (NFV Enablement Within SDN Data Plane), where we postulate stateful NF processing within the SDN data plane, controlled by the SDN controller. In NEWS, we extend the existing SDN architecture to support customized flow handling based on higher layer information in the packet beyond layer 2-4 headers. Network function (NF) instances can be created dynamically and inserted into the service chain on demand. We have implemented a prototype of this architecture based on Open vSwitch that keeps most of the processing in the data plane even when higher layer information is used in packet-handling, which keeps the data plane fast and scalable. We believe Application-aware or service-aware virtualized network functions such as content-based routing, service-specific load balancing and other virtualized functions will be important components in emerging and future software-defined infrastructure and software-defined exchanges where it is not longer sufficient to simply provide network connectivities based on IP prefixes or TCP/DUP ports, but instead offer more advanced application-aware service peerings with resource guarantees and performance assurance. We believe that our research experiences and insights in these areas of SDN will add to the discussion of this workshop.

Personal Background.

Zhi-Li Zhang received the B.S. degree in computer science from Nanjing University, China and his M.S. and Ph.D. degrees in computer science from the University of Massachusetts. He joined the faculty of the Department of Computer Science and Engineering at the University of Minnesota in 1997, where he is currently the Qwest Chair Professor in Telecommunications and Distinguished McKnight University Professor. He currently also serves as the Associate Director for Research at the Digital Technology Center, University of Minnesota. Prof. Zhang's research interests lie broadly in computer communication and networks, Internet technology, multimedia and emerging applications. His past research was centered on the analysis, design and development of scalable Internet QoS solutions to support performance-demanding multimedia applications. His current research thrusts focus primarily on i) building highly scalable, resilient and secure Internet infrastructure and mechanisms to enhance Internet service availability, reliability, mobility, manageability and security; and on ii) developing next-generation, service-oriented, manageable and economically viable Internet architectures to provide better support for creation, deployment, operations and and management of value-added Internet services and underlying networks. Prof. Zhang is co-recipient of an ACM SIGMETRICS best paper award, an IEEE International Conference on Network Protocols (ICNP) best paper award, an IEEE INFOCOM best paper award, a RAID best paper award and a SIMPLEX best paper award. He is a member of IEEE and ACM, and a Fellow of IEEE.