Feature Topic Proposal to

IEEE Computer

"Software Defined Networking: Standardization"

SDN: The Second Wave of Cloud Computing

The first wave of cloud computing was to centralize and virtualize servers into the clouds, with a phenomenal result. The emerging second wave, named Software Defined Networking (SDN), is to centralize and virtualize networking, especially its control, into the clouds. SDN deployment started from data centers and now expands to the model of "networking as a service" (NaaS) offered by the operators to enterprise and residential subscribers. By centralizing the control-plane software of routers and switches to the controller, and its applications, and controlling the data-plane of these devices remotely, SDN reduces the capital expenditure (CAPEX) and operational expenditure (OPEX) because the devices become simpler and hence cheaper and number of administrators could be reduced. SDN also enables fast service orchestration because the data plane is highly programmable from the remote control plane at controllers and applications.

Need for Standardization

However, as we detach control plane from where data plane resides, new protocols shall be introduced between control plane and data plane, as the southbound API between controllers and devices and the northbound API between controllers and applications. As we further extend the control plane from controllers to applications such as Service Chaining (SC) and data plane from devices to Network Function Virtualization (NFV), newer mechanisms and APIs need to be added to these APIs. To avoid fragmented markets, these southbound APIs and northbound APIs need to be standardized in time. There are multiple standard bodies competing or cooperating for the game, including ONF (Open Networking Foundation), IETF (Internet Engineering Task Force), ETSI (European Telecommunications Standards Institute), and ITU (International Telecommunication Union), with ONF taking the lead in growing the dominant OpenFlow protocol for southbound API. ONF also certified several test labs to help watch how the defined standards are being implemented on commercial products. However, the northbound API and the SC API and NFV API are still under development. For SDN to grow stably with a unified market where all devices, controllers, applications, SCs, and NFVs are highly interoperable, standardization plays a critical role, along with its associated test lab facilities to enforce the standards.

ONF and Its Test Labs

As the leading organization driving SDN standardization, ONF is the focal point to understand the state-of-the-art. This feature topic aims to examine the status of standardization and market

maturity by looking at what ONF and its certified test labs are doing and have found so far. Instead of having an open call to solicit paper submissions, we shall invite ONF and its test labs to contribute articles. We list topics of interest below. To avoid much overlap in the contents they cover, we separate areas of coverage from the invitees as follows.

Topics of Interest
- Evolution of the OpenFlow protocol
- OpenFlow switch specification
- Southbound and northbound APIs
- Interfaces between controllers, switches, applications, Service Chaining (SC), and Network Function Virtualization (NFV)
- Conformance, interoperability, performance, and functionality testing
- Test methodologies and tools
- Plugfest events
- Test result statistics and analysis
- SDN use cases for data centers, operators, and enterprises
- Current issues of working groups

ONF
- Evolution of the OpenFlow protocol
- OpenFlow switch specification
- Conformance test suite
- Interoperability test suite
- Plugfest events
- Current focus of Working Groups
- Summary of use cases

InCNTRE
- Test methodologies and tools
- Conformance test tools
- Test services on conformance, interoperability, performance, and proof-of-concepts
- Test result analysis

UNH/IOL
- Application test suite
- Interoperability test suite
- Use cases

Schedule

Manuscript Submission: May 15, 2014

Notification of Review Comments: July 31, 2014

Final Manuscript Due: August 31, 2014

Publication: November 2014

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Short Bio of Guest Editors

Ying-Dar Lin is Professor of Computer Science at National Chiao Tung University (NCTU) in Taiwan. He received his Ph.D. in Computer Science from UCLA in 1993. He served as the CEO of Telecom Technology Center during 2010-2011 and a visiting scholar at Cisco Systems in San Jose during 2007–2008. Since 2002, he has been the founder and director of Network Benchmarking Lab (NBL, www.nbl.org.tw), which reviews network products with real traffic. He also cofounded L7 Networks Inc. in 2002, which was later acquired by D-Link Corp. He recently, in May 2011, founded Embedded Benchmarking Lab (www.ebl.org.tw) to extend into the review of handheld devices. His research interests include design, analysis, implementation, and benchmarking of network protocols and algorithms, quality of services, network security, deep packet inspection, P2P networking, and embedded hardware/software co-design. His work on "multi-hop cellular" was the first along this line, and has been cited over 600 times and standardized into IEEE 802.11s, IEEE 802.15.5, IEEE 802.16j, and 3GPP LTE-Advanced. He is an IEEE Fellow (class of 2013) for his contributions to multi-hop cellular communications and deep packet inspection. He is currently on the editorial boards of IEEE Transactions on Computers, IEEE Computer, IEEE Network, IEEE Communications Magazine - Network Testing Series, IEEE Wireless Communications, IEEE Communications Surveys and Tutorials, IEEE Communications Letters, Computer Communications, Computer Networks, and IEICE Transactions on Information and Systems. He recently published a textbook "Computer Networks: An Open Source Approach" (www.mhhe.com/lin), with Ren-Hung Hwang and Fred Baker (McGraw-Hill, 2011). It is the first text that interleaves open source implementation examples with protocol design descriptions to bridge the gap between design and implementation.

Dan Pitt is Executive Director of the Open Networking Foundation, joining on its public launch in March 2011. Dan spent twenty years developing networking architecture, technology, standards, and products at IBM Networking Systems in North Carolina, IBM Research Zurich in Switzerland, Hewlett Packard Labs in Palo Alto, and Bay Networks in Santa Clara, Cal., where he was vice president of the Bay Architecture Lab. When Nortel bought Bay Networks, Dan became vice president of Nortel's Enterprise Solutions Technology Center, spanning nine cities on four continents. From 2002–2007 he served as dean of the school of engineering at Santa Clara University and holder of the Sobrato Chair in Engineering. From 2007–2011 he advised and served in executive operational roles in startup companies in the U.S., Canada, and Australia, most recently as an executive in residence at the Plug and Play Tech Center in Sunnyvale, Cal. Dan received a B.S. in mathematics (magna cum laude) from Duke University and an M.S. and Ph.D. in computer science from the University of Illinois. He taught as an adjunct professor at Duke University and the

University of North Carolina for ten years and has fifty publications and one patent to his credit.

David Hausheer is assistant professor at the Department of Electrical Engineering and Information Technology of the Technische Universitaet Darmstadt since May 2011. He holds a diploma degree in electrical engineering and a Ph.D. degree in technical sciences from ETH Zurich. From 2005 - 2011 he has been employed as a senior researcher and lecturer at University of Zurich, Switzerland, while being on leave as a visiting scholar at EECS, UC Berkeley from October 2009 to April 2011 under an SNSF fellowship for advanced researchers. David has been a co-applicant for several national and international research projects, including the German CRC MAKI, SNSF DaSAHIT, and the EU projects SESERV, SmartenIT, and eCOUSIN, as well as the Cisco URP project SCRIPT and the Deutsche Telekom project D-Nets. His research interests include several networked systems research areas, including software-defined networking, peer-to-peer and overlay networks, energy-efficient networking, and network economics. David has co-authored more than 70 peer-reviewed publications (e.g., IEEE CNSM, IFIP/IEEE IM, IEEE ICC, IEEE LCN, IEEE/IFIP NOMS, IFIP Networking, IEEE P2P, IEEE ICNP, IEEE CCNC, Springer JNSM, Elsevier ComNet). He is also executive committee member of the IEEE Computer Society TCCC, steering committee member of IFIP/ACM AIMS, and associate editor of Wiley IJNM. Moreover, he has been co-editor of the book "Towards the Future Internet - A European Research Perspective" published by IOS Press and guest editor of the Wiley IJNM special issue on "Economic Traffic Management". David also served as OC member for IEEE BoD (2006-2010), IFIP/ACM AIMS (2007-2009), the Dagstuhl BoD Seminar 2009, IEEE P2P 2012, and CNSM SETM 2013. Furthermore, he acted as a reviewer for several journals (e.g., IEEE TNSM, Elsevier ComNet, IEEE COMMAG, Springer JNSM, IEEE Multimedia, IEEE COMCOM, IEEE Communications Letters) and served as PC member for several conferences and workshops (e.g., IFIP Networking, IEEE LCN, IEEE P2P, IEEE CNSM, IFIP/IEEE IM, IEEE/IFIP NOMS, IFIP/ACM AIMS, IEEE CCNC, and IEEE ICC NSO).

Erica Johnson combines business acumen and an in-depth understanding of complex networking technology to direct the University of New Hampshire InterOperability Laboratory (UNH-IOL). In this capacity, Erica oversees all aspects of the testing services the UNH-IOL offers for more than 20 unique data networking and storage technologies. Erica's strategic management of these services includes relationships with industry forums, high-profile test events and UNH-IOL operations. In recognition of ability to drive technical innovation, Fierce Telecom named Erica to the publication's 2011 Women in Wireline. Furthermore, in 2010, UNH awarded Erica the UNH Women's Commission Stephanie Thomas Staff Award in honor of her achievements in promoting and embodying the advancement of women in the sciences. Widely recognized as an industry leader, Erica was appointed co-editor of the Network Testing Series for IEEE Communications Magazine in 2010. In addition, she serves as an IPv6 Ready Logo Regional Officer, IPv6 Forum Fellow and USGv6 Test Program lead. In her role within the University of New Hampshire, Erica engages daily with industry

leaders, members of the local community, faculty and students. She is an advisor for the UNH Broadband Center of Excellence (BCoE), a Director of the College of Engineering and Physical Sciences (CEPS) Alumni Society Board, and participates on the Electrical and Computer Engineering Advisory Board and the Computer Science Advisory Board. Erica takes great pride in using her entrepreneurial and technical skills to train the workforce's next generation of engineers, and often supports university researchers with grant proposals. Erica received her Master of Business Administration from the University of New Hampshire in 2011, and received a Bachelor of Science in Computer Science, also from the University of New Hampshire, in 2001. She joined the UNH-IOL in 1999 as an undergraduate student in Computer Science.

Yi-Bing Lin is the Vice President and Chair Professor with the College of Computer Science, National Chiao Tung University (NCTU), Hsinchu, Taiwan, and a Visiting Professor with King Saud University, Riyadh, Saudi Arabia. He is the author of the books Wireless and Mobile Network Architecture (New York: Wiley, 2001), Wireless and Mobile All-IP Networks (New York: Wiley, 2005), and Charging for Mobile All-IP Telecommunications (New York: Wiley, 2008). He received numerous research awards including the National Science Council Distinguished Researcher Award in 2005 and the Academic Award of the Ministry of Education in 2006. He is a fellow of ACM, AAAS, and IET.

List of Related SIs in Other Journals or Magazines

To our knowledge, currently no journal special issue or magazine feature topic is devoted to SDN. Although several journal CFPs have directly or indirectly addressed research issues on software defined networking, it only concentrated on architecture and algorithm design rather than standardization. Therefore, we strongly believe that it would be a good timing to propose a CFP for SDN standardization.

IEEE Communications Magazine, 2014
Feature Topic on 5G Networks: End-to-end Architecture and Infrastructure
http://www.comsoc.org/files/Publications/Magazines/ci/cfp/cfpcommag1114.html

IEEE Communications Magazine, 2014
Special Issue on Recent Advances in Technologies for Extremely Dense Wireless Networks
http://www.comsoc.org/files/Publications/Magazines/ci/cfp/cfpcommag0115.html

Journal of Network and Systems Management, Springer, 2013
Special Issue on Management of Software Defined Networks,
http://static.springer.com/sgw/documents/1383902/application/pdf/JNSM-SDN-Mngmnt-SI-CFP-v4
-18March13.pdf

List of Related Conferences

In addition to SDN works appearing in all the top networking conferences such as ACM SIGCOMM, and IEEE GLOBECOM, a number of smaller conferences and workshops have focused on the area of SDN in recent years. Given the large number of related conferences and workshops, the demand for a special issue or feature topic on this topic should be strong.

SDNMO 2014: 1st IEEE / IFIP International Workshop on SDN Management and Orchestration
http://clayfour.ee.ucl.ac.uk/sdnmo2014/

SDN'14: 1st Workshop on Software-Defined Networking
https://fedcsis.org/sdn

1st IEEE WoWMoM Workshop on Software Defined Networking Architecture and Applications
http://www.cnrl.colostate.edu/sdnwmom2014/

HotSDN 2013: ACM SIGCOMM Workshop on Hot Topics in Software Defined Networking
http://conferences.sigcomm.org/sigcomm/2013

SDN4FNS 2013: 1st IEEE Workshop on Software Defined Networks for Future Networks and Services
http://sites.ieee.org/sdn4fns/files/2013/09/call-for-papers.pdf

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