

SDN Reading List

SDN Reading List

(compiled by *Cristian Lumezanu*; to add a resource to this page, please email your suggestions to readinglist@opennetworking.org)



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Towards SDN

MOTIVATIONS

The Future of Networking, and the Past of Protocols, Scott Shenker ([video of talk at Ericsson](#))

BEGINNINGS

The Road to SDN, Nick Feamster, Jennifer Rexford, Ellen Zegura, [2013](#)

Ethane: Taking Control of the Enterprise, Martin Casado, Michael J. Freedman, Justin Pettit, Jianying Luo, Nick McKeown, Scott Shenker, [Sigcomm 2007](#)

Design and Implementation of a Routing Control Platform, Matthew Caesar, Donald Caldwell, Nick Feamster, Jennifer Rexford, Aman Shaikh, Jacobus van der Merwe, [NSDI 2005](#)

A Clean Slate 4D Approach to Network Control and Management, Albert Greenberg, Gisli Hjalmtysson, David A. Maltz, Andy Myers, Jennifer Rexford, Geoffrey Xie, Hong Yan, Jibin Zhan, Hui Zhang, [CCR 2005](#)

SANE: A Protection Architecture for Enterprise Networks, Martin Casado, Tal Garfinkel, Aditya Akella, Michael J. Freedman, Dan Boneh, Nick McKeown, Scott Shenker, [Usenix Security 2006](#)

Tesseract: A 4D Network Control Plane, Hong Yan, David A. Maltz, T.S. Eugene Ng, Hemant Gogineni, Hui Zhang, Zheng Cai, [NSDI 2007](#)

The Case for Separating Routing from Routers, Nick Feamster, Hari Balakrishnan, Jennifer Rexford, Aman Shaikh, Jacobus van der Merwe, [FDN A 2004](#)

A Survey of Active Network Research, David L. Tennenhouse, Jonathan M. Smith, W. David Sincoskie, David J. Wetherall, Gary J. Minden, [IEEE Communications 1997](#)

The Tempest: A Practical Framework for Network Programmability, Jacobus E. van der Merwe, Sean Rooney, Ian Leslie, Simon Crosby, [IEEE Network 1998](#)

In VINI Veritas: Realistic and Controlled Network Experimentation, Andy Bavier, Nick Feamster, Mark Huang, Larry Peterson, Jennifer Rexford, [SIGCOMM 2006](#)

IETF ForCES (Forwarding and Control Element Separation)

OPENFLOW

OpenFlow: Enabling Innovation in Campus Networks, Nick McKeown, Tom Anderson, Hari Balakrishnan, Guru Parulkar, Larry Peterson, Jennifer Rexford, Scott Shenker, Jonathan Turner, [CCR 2008](#)

What OpenFlow is (and more importantly, what it's not), Martin Casado

Programming Protocol-Independent Packet Processors, Pat Bosshart, Dan Daly, Martin Izzard, Nick McKeown, Jennifer Rexford, Dan Talayco, Amin Vahdat, George Varghese, David Walker



SDN Building Blocks

GENERAL DESIGN

Fabric: A Retrospective on Evolving SDN, Martin Casado, Teemu Koponen, Scott Shenker, Amin Tootoonchian, [HotSDN 2012](#)

The Scaling Implications of SDN, Martin Casado

On the Scalability of Software-Defined Networking, Soheil Hassas Yeganeh, Amin Tootoonchian, Yashar Ganjali, [IEEE Communications Magazine Feb 2013](#)

A Highly Available Software Defined Fabric, Aditya Akella, Arvind Krishnamurthy, [HotNets 2014](#)

Software-Defined Networking: A Comprehensive Survey, Diego Kreutz, Fernando M.V. Ramos, Paulo Esteves Verissimo, Christian Esteve Rothenberg, Siamak Azodolmolky, Steve Uhlig, [IEEE 2015](#)

CONTROL PLANE

NOX: Towards an Operating System for Networks, Natasha Gude, Teemu Koponen, Justin Pettit, Ben Pfaff, Martin Casado, Nick McKeown, Scott Shenker, [CCR 2008](#)

Can the Production Network Be the Testbed?, Rob Sherwood, Glen Gibb, Kok-Kiong Yap, Guido Appenzeller, Martin Casado, Nick McKeown, Guru Parulkar, [OSDI 2010](#)

Onix: A Distributed Control Platform for Large-scale Production Networks, Teemu Koponen et al, [OSDI 2010](#)

The Beacon OpenFlow Controller, David Erickson, [HotSDN 2013](#)

Maestro: A System for Scalable OpenFlow Control, Zheng Cai, Alan L. Cox, T.S. Eugene Ng, [2011](#)

The Controller Placement Problem, Brandon Heller, Rob Sherwood, Nick McKeown, [HotSDN 2012](#)

HyperFlow: A Distributed Control Plane for OpenFlow, Amin Tootoonchian, Yashar Ganjali, [INM 2010](#)

Exploiting Locality in Distributed SDN Control, Stefan Schmid, Jukka Suomela, [HotSDN 2013](#)

Kandoo: A Framework for Efficient and Scalable Offloading of Control Applications, Soheil Hassas Yeganeh, Yashar Ganjali, [HotSDN 2012](#)

Applying Operating System Principles to SDN Controller Design, Matthew Monaco, Oliver Michel, Eric Keller, [HotNets 2013](#)

Software Transactional Networking: Concurrent and Consistent Policy Composition, Marco Canini, Petr Kuznetsov, Dan Levin, Stefan Schmid, [HotSDN 2013](#)

The Case for Reliable Software Transactional Networking, Marco Canini, Petr Kuznetsov, Dan Levin, [Stefan Schmid, 2013](#)

Beehive: Towards a Simple Abstraction for Scalable Software-defined Networks, Soheil Hassas Yeganeh, Yashar Ganjali, [HotNets 2014](#)

Tolerating SDN Application Failures with Lego SDN, Balakrishnan Chadrsekaran, Theophilus Benson, [HotNets 2014](#)

Scotch: Elastically Scaling up SDN Control-Plane using vSwitch based Overlay, An Wang, Yang Guo, Fang Hao, T.V. Lakshman, Songqing Chen, [CoNext 2014](#)

ONOS: Towards An Open Distributed SDN OS, Pankaj Berde, Matteo Gerola, Jonathan Hart, Yuta Higuchi, Masayoshi Kobayashi, Toshio Koide, Bob Lantz, Brian O'Connor, Pavlin Radoslavov, William Snow, Guru Parulakar, [HotSDN 2014](#)

A Network State Management Service, Peng Sun, Ratul Mahajan, Jennifer Rexford, Lihua YuanMing Zhang, Ahsan Arefin, [Sigcomm 2014](#)

CoVisor: A Compositional Hypervisor for Software-Defined Networks, Xin Jin, Jennifer Gossels, Jennifer Rexford, David Walker, [NSDI 2015](#)

Towards Secure and Dependable Software-defined Networks, Diego Kreutz, Fernando M.V. Ramos, Paulo Verissimo, [HotSDN 2013](#)

DATA PLANE

Blueswitch: Enabling provably consistent configuration of network switches, Han J.H., Mundkur P., Rotsos C., Antichi G., Dave N., Moore A.W., Neumann P.G., [ACM/IEEE ANCS 2015](#)

DevoFlow: Scaling Flow Management for High-performance Networks, Andrew R. Curtis, Jeffrey C. Mogul, Jean Tourrilhes, Praveen Yalagandula, Puneet Sharma, Sujata Banerjee, [Sigcomm 2011](#)

Scalable Flow-based Networking with DIFANE, Minlan Yu, Jennifer Rexford, Michael J. Freedman, Jia Wang, [Sigcomm 2010](#)

Using CPU as a Traffic Co-processing Unit in Commodity Switches, Guohan Lu, Rui Miao, Yongqiang Xiong, Chuanxiong Guo, [HotSDN 2012](#)

Hey, You Darned Counters! Get off My ASIC!, Jeffrey C. Mogul, Paul Congdon, [HotSDN 2012](#)

Forwarding Metamorphosis: Fast Programmable Match-Action Processing in Hardware for SDN, Pat Bosshart, Glen Gibb, Hun-Seok Kim, George Varghese, Nick McKeown, Martin Izzard, Fernando Mujica, Mark Horowitz, [Sigcomm 2013](#)

No Silver Bullet: Extending SDN to the Data Plane, Anirudh Sivaraman, Keith Weinstein, Suvinay Subramanian, Hari Balakrishnan, [HotNets 2013](#)

Reclaiming the Brain: Useful OpenFlow Functions in the Data Plane, Liron Schiff, Michael Borokhovich, Stefan Schmid, [HotNets 2014](#)

Application-aware Data Plane Processing in SDN, Hesham Mekky, Fang Hao, Sarit Mukherjee, Zhi-Li Zhang, T.V. Lakshman, [HotSDN 2014](#)

Shadow MACs: Scalable Label Switching for Commodity Ethernet, Kanak Agarwal, Colin Dixon, Eric Rozner, John Carter, [HotSDN 2014](#)

CAB: A Reactive Wildcard Rule Caching System for Software-Defined Networks, Bo Yan, Yang Xu, Hongya Xing, Kang Xi, H. Jonathan Chao, [HotSDN 2014](#)

An Adaptable Rule Placement for Software-defined Networks, Shuyuan Zhang, Franjo Ivancic, Cristian Lumezanu, Yifei Yuan, Aarti Gupta, Sharad Malik, [DSN 2014](#)

Compiling Packet Programs to Reconfigurable Switches, Lavanya Jose, Lisa Yan, George Varghese, Nick McKeown, [NSDI 2015](#)

The Design and Implementation of Open vSwitch, Ben Pfaff et al., [NSDI 2015](#)

CacheFlow: Dependency-aware rule-caching for software-defined networks, in Symposium on SDN Research, Naga Katta, Omid Alipourfard, Jennifer Rexford, and David Walker, SOSR March 2016

PISCES: A programmable, protocol-independent software switch" Muhammad Shahbaz, Sean Choi, Ben Pfaff, Changhoon Kim, Nick Feamster, Nick McKeown, Jennifer Rexford, ACM SIGCOMM, August 2016 .

HYBRID NETWORKS

Panopticon: Reaping the Benefits of Partial SDN Deployment in Enterprise Networks, Dan Levin, Marco Canini, Stefan Schmid, Fabian Schaffert, Anja Feldmann, [USENIX ATC 2014](#)

HybNET: Network Manager for A Hybrid Network Infrastructure, Hui Lu, Nipun Arora, Hui Zhang, Cristian Lumezanu, Junghwan Rhee, Guofei

Jiang, [Middleware \(industrial track\) 2013](#)

ClosedFlow: OpenFlow-like Control over Proprietary Devices, Ryan Hand, Eric Keller, [HotSDN 2014](#)

Telekinesis: Controlling Legacy Switch Routing with OpenFlow in Hybrid Networks, Cheng Jin, Cristian Lumezanu, Qiang Xu, Zhi-Li Zhang, Guofei Jiang, SOSR 2015.

PROGRAMMING

Languages for Software-Defined Networks, Nate Foster et al, [IEEE Communication Magazine Feb 2013](#)

Frenetic: A Network Programming Language, Nate Foster, Rob Harrison, Michael J. Freedman, Christopher Monsanto, Jennifer Rexford, Alec Story, David Walker, [ICFP 2011](#)

Composing Software-Defined Networks, Christopher Monsanto, Joshua Reich, Nate Foster, Jennifer Rexford, David Walker, [NSDI 2013](#)

Participatory Networking: An API for Application Control of SDNs, Andrew D. Ferguson, Arjun Guha, Chen Liang, Rodrigo Fonseca, Shriram Krishnamurthi, [Sigcomm 2013](#)

A Compiler and Run-time System for Network Programming Languages, Christopher Monsanto, Nate Foster, Rob Harrison, David Walker, [POPL 2012](#)

Machine-Verified Network Controllers, Arjun Guha, Mark Reitblatt, Nate Foster, [PLDI 2013](#)

Nettle: Functional Reactive Programming of OpenFlow Networks, Andreas Voellmy and Paul Hudak, [PADL 2011](#)

Procera: A Language for High-Level Reactive Network Control, Andreas Voellmy, Hyojoon Kim, Nick Feamster, [HotSDN 2012](#)

FatTire: Declarative Fault Tolerance for Software-defined Networks, Mark Reitblatt, Marco Canini, Arjun Guha, Nate Foster, [HotSDN 2013](#)

A Balance of Power: Expressive, Analyzable Controller Programming, Tim Nelson, Arjun Guha, Daniel J. Dougherty, Kathi Fisler, Shriram Krishnamurthi, [HotSDN 2013](#)

Hierarchical Policies for Software Defined Networks, Andrew D. Ferguson, Arjun Guha, Chen Liang, Rodrigo Fonseca, Shriram Krishnamurthi, [HotSDN 2012](#)

Splendid Isolation: A Slice Abstraction for Software-Defined Networks, Stephen Gutz, Alec Story, Cole Schlesinger, Nate Foster, [HotSDN 2012](#)

CAP for Networks, Aurojit Panda, Colin Scott, Ali Ghodsi, Teemu Koponen, Scott Shenker, [HotSDN 2013](#)

Corybantic: Towards the Modular Composition of SDN Control Programs, Jeffrey C. Mogul, Alvin AuYoung, Sujata Banerjee, Lucian Popa, Jeongkeun Lee, Jayaram Mudigonda, Puneet Sharma, Yoshio Turner, [HotNets 2013](#)

NetEgg: Programming Network Policies by Examples, Yifei Yuan, Rajeev Alur, Boon Thau Loo, [HotNets 2014](#)

Tango: Simplifying SDN Control with Automatic SwitchProperty Inference, Abstraction, and Optimization, Aggelos Lazaris, Daniel Tahara, Xin Huang, Li Erran Li, Andreas Voellmy, Y. Richard Yang, Minlan Yu, [CoNext 2014](#)

Merlin: A Language for Provisioning Network Resources, Robert Soulé, Shrutarashi Basu, Parisa Jalili Marandi, Fernando Pedone, Robert Kleinberg, Emin Gün Sirer, Nate Foster, [CoNext 2014](#)

Democratic Resolution of Resource Conflicts Between SDN Control Programs, Alvin AuYoung, Yadi Ma, Sujata Banerjee, Jeongkeun Lee, Puneet Sharma, Yoshio Turner, Chen Liang, Jeffrey C. Mogul, [CoNext 2014](#)

Kinetic: Verifiable Dynamic Network Control, Hyojoon Kim, Joshua Reich, Arpit Gupta, Muhammad Shahbaz, Nick Feamster, Russ Clark, [NSDI 2015](#)

PGA: Using Graphs to Express and Automatically Reconcile Network Policies, Chaithan Prakash, Jeongkeun Lee, Yoshio Turner, Joon-Myung Kang, Aditya Akella, Sujata Banerjee, Charles Clark, Yadi Ma, Puneet Sharma, Ying Zhang, [Sigcomm 2015](#)

SNAP: Stateful network-wide abstractions for packet processing, Mina Tahmasbi Arashloo, Yaron Koral, Michael Greenberg, Jennifer Rexford, and David Walker, ACM SIGCOMM, August 2016.

UPDATES

Abstractions for Network Update, Mark Reitblatt, Nate Foster, Jennifer Rexford, Cole Schlesinger, David Walker, [Sigcomm 2012](#)

Update: Updating Data Center Networks with Zero Loss, Hongqiang Harry Liu, Xin Wu, Ming Zhang, Lihua Yuan, Roger Wattenhofer, David A.

Maltz, [Sigcomm 2013](#)

Walk the Line: Consistent Network Updates with Bandwidth Guarantees, Soudeh Ghorbani, Matthew Caesar, [HotSDN 2012](#)

A Safe, Efficient Update Protocol for OpenFlow Networks, Rick McGreer, [HotSDN 2012](#)

Incremental Consistent Updates, Naga Praveen Katta, Jennifer Rexford, David Walker, [HotSDN 2013](#)

OF.CPP: Consistent Packet Processing for OpenFlow, Peter Perešini, Maciej Kuniar, Nedeljko Vasi, Marco Canini, Dejan Kosti, [HotSDN 2013](#)

HotSwap: Correct and Efficient Controller Upgrades for Software-Defined Networks, Laurent Vanbever, Joshua Reich, Theophilus Benson, Nate Foster, Jennifer Rexford, [HotSDN 2013](#)

On Consistent Updates in Software Defined Networks, Ratul Mahajan, Roger Wattenhofer, [HotNets 2013](#)

Dynamic Scheduling of Network Updates, Xin Jin, Hongqiang Harry Liu, Rohan Gandhi, Srikanth Kandula, Ratul Mahajan, Ming Zhang, Jennifer Rexford, Roger Wattenhofer, [Sigcomm 2014](#)

Good Network Updates for Bad Packets, Arne Ludwig, Matthias Rost, Damien Foucard, Stefan Schmid, [HotNets 2014](#)

Providing Reliable FIB Update Acknowledgments in SDN, Maciej Kuniar, Peter Perešini, Dejan Kosti, [CoNext 2014](#)

Incremental Update for a Compositional SDN Hypervisor, Xin Jin, Jennifer Rexford, David Walker, [HotSDN 2014](#)

Compiling Minimum Incremental Update for Modular SDN Languages, Xitao Wen, Chunxiao Diao, Xun Zhao, Yan Chen, Li Erran Li, Bo Yang, Kai Bu, [HotSDN 2014](#)

Enforcing Customizable Consistency Properties in Software-Defined Networks, Wenxuan Zhou, Dong Jin, Jason Croft, Matthew Caesar, P. Brighten Godfrey, [NSDI 2014](#)

Efficient Synthesis of Network Updates, Jedidiah McClurg, Hossein Hojjat, Pavol Cerny, Nate Foster, [PLDI 2015](#)

Survey of Consistent Network Updates, Klaus-Tycho Foerster, Stefan Schmid, and Stefano Vissicchio.
[ArXiv Technical Report, September 2016](#)

Software defined networks: It's about time, Tal Mizrahi and Yoram Moses, IEEE INFOCOM 2016

EMULATION AND SIMULATION

A Network in a Laptop: Rapid Prototyping for Software-Defined Networks, Bob Lantz, Brandon Heller, Nick McKeown, [HotNets 2010](#)
<http://conferences.sigcomm.org/co-next/2012/e proceedings/conext/p253.pdf>

Fast, Accurate Simulation for SDN Prototyping, Mukta Gupta, Joel Sommers, Paul Barford, [HotSDN 2013](#)

High-Fidelity Switch Models for Software-Defined Network Emulation, Danny Yuxing Huang, Kenneth Yocum, Alex C. Snoeren, [HotSDN 2013](#)

VERIFICATION

Veriflow: Verifying Network-Wide Invariants in Real Time, Ahmed Khurshid, Wenxuan Zhou, Matthew Caesar, P. Brighten Godfrey, [NSDI 2013](#)

Header Space Analysis: Static Checking for Networks, Peyman Kazemian, George Varghese, Nick McKeown, [NSDI 2012](#)

Real Time Network Policy Checking using Header Space Analysis, Peyman Kazemian, Michael Chang, Hongyi Zeng, George Varghese, Nick McKeown, Scott Whyte, [NSDI 2013](#)

A NICE Way to Test OpenFlow Applications, Marco Canini, Daniele Venzano, Peter Perešini, Dejan Kosti, Jennifer Rexford, [NSDI 2012](#)

A SOFT Way for OpenFlow Interoperability Testing, Maciej Kuniar, Peter Perešini, Marco Canini, Daniele Venzano, Dejan Kosti, [CoNEXT 2012](#)

FlowChecker: Configuration, Analysis, and Verification of Federated OpenFlow Infrastructures, Ehab Al-Shaer, Saeed Al-Haj, [SafeConfig 2010](#)

Towards A Verifiable Software Dataplane, Mihai Dobrescu, Katerina Argyraki, [HotNets 2013](#)

An Assertion Language for Debugging SDN Applications, Ryan Beckett, X. Kelvin Zou, Shuyuan Zhang, Sharad Malik, Jennifer Rexford, David Walker, [HotSDN 2014](#)

Towards Correct Network Verification, Soudeh Ghorbani, Brighten Godfrey, [HotSDN 2014](#)

TESTING

Enabling Performance Evaluation Beyond 10Gbps, Gianni Antichi, Charalampos Rotsos, Andrew W. Moore ACM, [SIGCOMM 2015 Demo](#)

Leveraging SDN Layering to Systematically Troubleshoot Networks, Brandon Heller et al, [HotSDN 2013](#)

Troubleshooting Blackbox SDN Control Software with Minimal Causal Sequences, Colin Scott et al., [Sigcomm 2014](#)

OFFRewind: Enabling Record and Replay Troubleshooting for Networks, Andreas Wundsam, Dan Levin, Srini Seetharaman, Anja Feldman, [Usenix ATC 2011](#)

Where Is the Debugger for My Software-Defined Network?, Nikhil Handigol, Brandon Heller, Vimalkumar Jeyakumar, David Mazières, Nick McKeown, [HotSDN 2012](#)

OFLOPS: An Open Framework for OpenFlow Switch Evaluation, Charalampos Rotsos, Nadi Sarrar, Steve Uhlig, Rob Sherwood, Andrew W. Moore, [PAM 2012](#)

Logically Centralized? State Distribution Trade-offs in Software Defined Networks, Dan Levin, Andreas Wundsam, Brandon Heller, Nikhil Handigol, Anja Feldman, [HotSDN 2012](#)

On Controller Performance in Software-Defined Networks, Amin Tootoonchian, Sergey Gorbunov, Yashar Ganjali, Martin Casado, Rob Sherwood, [Hot-ICE 2012](#)

Answering Why-Not Queries in Software-defined Networks with Negative Provenance, Yang Wu, Andreas Haeberlen, Wenchao Zhou, Boon Thau Loo, [HotNets 2013](#)

Controller-agnostic SDN Debugging, Ramakrishnan Durairajan, Joel Sommers, Paul Barford, [CoNext 2014](#)

What You Need to Know About SDN Flow Tables, Maciej Kuniar, Peter Perešini, Dejan Kosti, [PAM 2015](#)



SDN Applications

MONITORING AND MEASUREMENT

Software Defined Traffic Measurement with OpenSketch, Minlan Yu, Lavanya Jose, Rui Miao, [NSDI 2013](#)

FlowSense: Monitoring Network Utilization with Zero Measurement Cost, Curtis Yu, Cristian Lumezanu, Vishal Singh, Yueping Zhang, Guofei Jiang, Harsha V. Madhyastha, [PAM 2013](#)

Software-defined Latency Monitoring in Data Center Networks, Curtis Yu, Cristian Lumezanu, Abhishek Sharma, Qiang Xu, Guofei Jiang, Harsha V. Madhyastha, [PAM 2015](#)

Enabling Layer 2 Pathlet Tracing through ContextEncoding in Software-Defined Networking, Hui Zhang, Cristian Lumezanu, Junghwan Rhee, Nipun Arora, Qiang Xu, Guofei Jiang, [HotSDN 2014](#)

Online Measurement of Large Traffic Aggregates on Commodity Switches, Lavanya Jose, Minlan Yu, Jennifer Rexford, [Hot-ICE 2011](#)

Resource/Accuracy Tradeoffs in Software Defined Measurement, Masoud Moshref, Minlan Yu, Ramesh Govindan, [HotSDN 2013](#)

OpenTM: Traffic Matrix Estimator for OpenFlow Networks, Amin Tootoonchian, Monia Ghobadi, Yashar Ganjali, [PAM 2010](#)

Extensible and Scalable Network Monitoring using OpenSAFE, Jeffrey R. Ballard, Ian Rae, Aditya Akella, [INM/WREN 2010](#)

Lightweight DDoS Flooding Attack Detection using NOX/OpenFlow, Rodrigo Braga, Edjard Mota, Alexandre Passito, [LCN 2010](#)

DREAM: Dynamic Resource Allocation for Software-defined Measurement, Masoud Moshref, Minlan Yu, Ramesh Govindan, Amin Vahdat, [Sigcomm 2014](#)

Compiling Path Queries in Software-Defined Networks, Srinivas Narayana, Jennifer Rexford, David Walker, [HotSDN 2014](#)

SECURITY

Ethane: Taking Control of the Enterprise, Martin Casado, Michael J. Freedman, Justin Pettit, Jianying Luo, Nick McKeown, Scott Shenker, [Sigcomm 2007](#)

Resonance: Dynamic Access Control in Enterprise Networks, Ankur Nayak, Alex Reimers, Nick Feamster, Russ Clark, [WREN 2009](#)

OpenFlow Random Host Mutation: Transparent Moving Target Defense using Software Defined Networking, Jafar Haadi Jafarian, Ehab Al-Shaer, Qi Duan, [HotSDN 2012](#)

FRESCO: Modular Composable Security Services for Software-Defined Networks, Seungwon Shin, Phil Porras, Vinod Yagneswaran, Martin Fong, Guofei Gu, Mabry Tyson, [NDSS 2013](#)

NetFuse: Short-circuiting Traffic Surges in the Cloud, Ye Wang, Yueping Zhang, Vishal Singh, Cristian Lumezanu, Geoff Jiang, [ICC 2013](#)

Improving Network Management with Software Defined Networking, Hyojoon Kim, Nick Feamster, [IEEE Communications Magazine Feb 2013](#)

A Security Enforcement Kernel for OpenFlow Networks, Phillip Porras, Seungwon Shin, Vinod Yegneswaran, Martin Fong, Mabry Tyson, Guofei Gu, [HotSDN 2012](#)

FlowGuard: Building Robust Firewalls for Software-defined Networks, Hongxin Hu, Wonkyu Han, Gail-Joon Ahn, Ziming Zhao, [HotSDN 2014](#)

Fleet: Defending SDN from Malicious Administrators, Stephanos Matsumoto, Samuel Hitz, Adrian Perrig, [HotSDN 2014](#)

A Survey of Securing Networks Using Software Defined Networking, Syed Taha Ali, Vijay Sivaraman, Adam Radford, Sanjay Jha, [Transactions on Reliability 2015](#)

Software Defined Networking for Security Enhancement in Wireless Mobile Networks, Aaron Yi Ding, Jon Crowcroft, Sasu Tarkoma, Hannu Flinck, [Computer Networks 2014](#)

A Survey of Security in Software Defined Networks, Scott-Hayward S, Natarajan S, Sezer S, et al., [IEEE Communications Surveys and Tutorials, 2016](#)

CLOUD

Effective Resource Control Strategies using OpenFlow in Cloud Data Center, Adami D., Martini B., Antichi G., Giordano S., Gharbaoui M., Castoldi P., [IFIP/IEEE IM 2013](#)

On Virtualization-aware Traffic Engineering in OpenFlow Data Centers networks, Gharbaoui M., Martini B., Adami D., Antichi G., Giordano S., Castoldi P., [IFIP/IEEE NOMS 2014](#)

Applying NOX to the Datacenter, Arsalan Tavakoli, Martin Casado, Teemu Koponen, Scott Shenker, [HotNets 2009](#)

A Management Method of IP Multicast in Overlay Networks using OpenFlow, Yukihiro Nakagawa, Kazuki Hyoudou, Takeshi Shimizu, [HotSDN 2012](#)

Dynamic Graph Query Primitives for SDN-based Cloud Network Management, Ramya Raghavendra, Jorge Lobo, Kang-Won Lee, [HotSDN 2012](#)

Meridian: An SDN Platform for Cloud Network Services, Mohammad Banikazemi, David Olshefski, Anees Shaikh, John Tracey, Guohui Wang, [IEEE Communications Magazine Feb 2013](#)

BIGDATA

Transparent and Flexible Network Management for Big Data Processing in the Cloud, Anupam Das, Cristian Lumezanu, Yueping Zhang, Vishal Singh, Guofei Jiang, Curtis Yu, [HotCloud 2013](#)

Programming Your Network at Run-time for Big Data Applications, Guohui Wang, T.S. Eugene Ng, Anees Shaikh, [HotSDN 2012](#)

VIRTUALIZATION

Can the Production Network Be the Testbed?, Rob Sherwood, Glen Gibb, Kok-Kiong Yap, Guido Appenzeller, Martin Casado, Nick McKeown, Guru Parulkar, [OSDI 2010](#)

OpenNF: Enabling Innovation in Network Function Control, Aaron Gember-Jacobson, Raajay Viswanathan, Chaithan Prakash, Robert Grandl, Junaid Khalid, Sourav Das, Aditya Akella, [Sigcomm 2014](#)

SIMPLE-fying Middlebox Policy Enforcement Using SDN, Zafar Ayyub Qazi, Cheng-Chun Tu, Luis Chiang, Rui Miao, Vyas Sekar, Minlan Yu, [Sigcomm 2013](#)

FlowTags: Enforcing Network-Wide Policies in the Presence of Dynamic Middlebox Actions, Seyed Kaveh Fayazbakhsh, Vyas Sekar, Minlan Yu, Jeffrey C. Mogul, [HotSDN 2013](#)

Enabling Fast, Dynamic Network Processing with ClickOS, Joao Martins, Mohamed Ahmed, Costin Raiciu, Felipe Huici, [HotSDN 2013](#)

Design and Implementation of a Consolidated Middlebox Architecture, Vyas Sekar, Norbert Egi, Sylvia Ratnasamy, Michael K. Reiter, Guangyu Shi, [NSDI 2012](#)

Don't Call Them Middleboxes, Call Them Middlepipes, Hani Jamjoom, Dan Williams, Upendra Sharma, [HotSDN 2014](#)

ROUTING

Hedera: Dynamic Flow Scheduling for Data Center Networks, Mohammad Al-Fares, Sivasankar Radhakrishnan, Barath Raghavan, Nelson Huang, Amin Vahdat, [NSDI 2010](#)

ElasticTree: Saving Energy in Data Center Networks, Brandon Heller, Srinu Seetharaman, Priya Mahadevan, Yannis Yakoumis, Puneet Sharma, Sujata Banerjee, Nick McKeown, [NSDI 2010](#)

OpenFlow-based Server Load Balancing Gone Wild, Richard Wang, Dana Butnariu, Jennifer Rexford, [Hot-ICE 2011](#)

Plug-n-Serve: Load-balancing Web Traffic using OpenFlow, Nikhil Handigol, Srinivasan Seetharaman, Mario Flajslik, Nick McKeown, Ramesh Johari, [Sigcomm 2009 Demo](#)

Revisiting Routing Control Platforms with the Eyes and Muscles of Software-Defined Networking, Christian Esteve Rothenberg, Marcelo Ribeiro Nascimento, Marcos Rogerio Salvador, Carlos N.A. Correa, Sidney C. de Lucena, Robert Raszuk, [HotSDN 2012](#)

Traffic Engineering in Software-defined Networks, Sugam Agarwal, Murali Kodialam, T.V. Lakshman, [Infocom 2013](#)

A Declarative and Expressive Approach to Control Forwarding Paths in Carrier-Grade Networks, Renaud Hartert, Stefano Vissicchio, Pierre Schaus, Olivier Bonaventure, Clarence Filisfil, Thomas Telkamp, Pierre Francois, [Sigcomm 2015](#)

Central Control over Distributed Routing, Stefano Vissicchio, Olivier Tilmans, Laurent Vanbever, Jennifer Rexford, [Sigcomm 2015](#)

WAN

Inter-Domain Networking Innovation on Steroids: Empowering IXPs with SDN Capabilities, Chiesa M., Dietzel C., Antichi.G., Bruyere M., Castro I., Gusat M., King T., Moore A.W., Nguyen T.D., Owezarski P., Uhlig S., Canini M., [EEE Communication Magazine, October 2016](#)

Achieving High Utilization with Software-Driven WAN, Chi-Yao Hong, Srikanth Kandula, Ratul Mahajan, Ming Zhang, Vijay Gill, Mohan Nanduri, Roger Wattenhofer, [Sigcomm 2013](#)

B4: Experience with a Globally-Deployed Software Defined WAN, Sushant Jain et al., [Sigcomm 2013](#)

SDX: A Software Defined Internet Exchange, Arpit Gupta et al., [Sigcomm 2014](#)

Virtualizing the Access Network via Open APIs, Vijay Sivaraman, Hassan Habibi Gharakheili, Dennis Ong, John Matthews, Craig Russell, [CoNEXT T 2013](#)

BwE: Flexible, Hierarchical Bandwidth Allocation for WAN Distributed Computing, Alok Kumar et al., [Sigcomm 2015](#)

An Industrial-Scale Software Defined Internet Exchange Point [NSDI 2016](#)

OPTICAL

PAC.C, Saurav Das and others

Enabling the Future Optical Internet with OpenFlow: A Paradigm Shift in Providing Intelligent Optical Network Services, Dimitra Simeonidou, Reza Nejabati, Siamak Azodolmolky, [ICTON 2011](#)

Software-Defined Optical Networks Technology and Infrastructure: Enabling Software-Defined Optical Network Operations, Mayur Channegowda, Reza Nejabati, Dimitra Simeonidou, [Journal of Optical Communications and Networking 2013](#)

SDN and OpenFlow for Dynamic Flex-Grid Optical Access and Aggregation Networks, Neda Cvijetic, Akihiro Tanaka, Philip N. Ji, Karthik Sethuraman, Shuji Murakami, Ting Wang, [Journal of Lightwave Technology 2014](#)

First Field Trial of an OpenFlow-based Unified Control Plane for Multi-layer Multi-granularity Optical Networks, Lei Liu, Dongxu Zhang, Takehiro Tsuritani, Ricard Vilalta, Ramon Casellas, Linfeng Hong, Itsuro Morita, Hongxiang Guo, Jian Wu, Ricardo Martinez, Raul Muñoz, [Optical Fiber Communication Conference 2012](#)

Extending software defined network principles to include optical transport, Steven Gringeri, Nabil Bitar, Tiejun J. Xia, [IEEE Communications Magazine 2013](#)

Optimizing Bulk Transfers with Software-Defined Optical WAN, SIGCOMM 2016

WIRELESS

SoftRAN: Software Defined Radio Access Network, Aditya Gudipati, Daniel Perry, Li Erran Li, Sachin Katti, [HotSDN 2013](#)

OpenRadio: A Programmable Wireless Dataplane, Manu Bansal, Jeffrey Mehlman, Sachin Katti, Philip Levis, [HotSDN 2012](#)

Towards Programmable Enterprise WLANs with Odin, Lalith Suresh, Julius Schulz-Zander, Ruben Merz, Anja Feldmann, Teresa Vazao, [HotSDN 2012](#)

Towards Software-Defined Cellular Networks, Li Erran Li, Z. Morley Mao, Jennifer Rexford, [EWSDN 2012](#)

SoftMoW: Recursive and Reconfigurable Cellular WAN Architecture, Mehrdad Moradi, Wenfei Wu, Li Erran Li, Z. Morley Mao, [CoNext 2014](#)

SoftCell: Scalable and Flexible Cellular Core Network Architecture, SIGCOMM 2016