Yikai Lin

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RESEARCH INTERESTS

I have over five years of research experience in SDN and NFV, and am actively working on designing novel architectures, abstractions and interfaces for SDN applications, while applying SDN and NFV to emerging areas like 5G.

EDUCATION

University of Michigan, Ann Arbor 08/2015 - present
PhD candidate in Computer Science and Engineering
- Advisor: Professor Z. Morley Mao
- GPA: 3.94 / 4.00

Beijing University of Posts and Telecommunications, Beijing, China 09/2011 - 06/2015
Bachelor of Engineering in Communication Engineering
- Rank: 2 / 591, GPA: 91.7 / 100

PUBLICATIONS (BY TOPIC)

SDN & NFV

Yikai Lin, Yuru Shao, Xiao Zhu, Junpeng Guo, Kira Barton, and Z. Morley Mao, ADD: Application-Centric Data-Driven Controller Design, to appear in *Proceedings of the 5th ACM SIGCOMM Symposium on Software Defined Networking Research (SOSR), 2019*.

Yikai Lin, Ulaş C. Kozat, John Kaippallimalil, Mehrdad Moradi, Anthony C.K. Soong, and Z. Morley Mao, Pausing and Resuming Network Flows using Programmable Buffers, *Proceedings of the 4th ACM SIGCOMM Symposium on Software Defined Networking Research (SOSR), 2018*.

Mehrdad Moradi, Yikai Lin, Z. Morley Mao, Subhabrata Sen, and Oliver Spatscheck, SoftBox: A Customizable, Low-Latency, and Scalable 5G Core Network Architecture, *IEEE Journal on Selected Areas in Communications, 36(3), pp.438-456, 2018*.

Yangyang Wang, Jun Bi, Pingping Lin, Yikai Lin, and Keyao Zhang, SDI: a multi-domain SDN mechanism for fine-grained inter-domain routing, *Annals of Telecommunications, 71(11-12), pp.625-637, 2016*.

Pingping Lin, Jun Bi, Stephen Wolff, Yangyang Wang, Anmin Xu, Ze Chen, Hongyu Hu, and Yikai Lin, A West-East Bridge Based SDN Inter-Domain Testbed, *IEEE Communications Magazine, 53(2), pp.190-197, 2015*.

Zhongbao Zhang, Sen Su, Yikai Lin, Xiang Cheng, Kai Shuang, and Peng Xu, Adaptive Multi-objective Artificial Immune System based Virtual Network Embedding, *Journal of Network and Computer Applications, 53, pp.140-155, 2015*.

SECURITY

Mu Zhang, Chien-Ying Chen, Bin-Chou Kao, Yassine Qamsane, Yuru Shao, Yikai Lin, Elaine Shi, Sibin Mohan, Kira Barton, James Moyne, and Z. Morley Mao, Towards Automated Safety Vetting of PLC Code in Real-World Plants, to appear in *Proceedings of IEEE Symposium on Security and Privacy (S&P) 2019*.

Yunhan Jack Jia, Qi Alfred Chen, Yikai Lin, Chao Kong, and Z. Morley Mao, Open Doors for Bob and Mallory: Open Port Usage in Android Apps and Security Implications, *Proceedings of The 2nd IEEE European Symposium on Security and Privacy (EuroS&P), 2017*.

SMART MANUFACTURING

Efe C. Balta, Yikai Lin, Kira Barton, Dawn Tilbury, Z. Morley Mao, Production as a Service: A Digital Manufacturing Framework for Optimizing Utilization, *IEEE Transactions on Automation Science and Engineering, (99), pp.1-11, 2018*.

Efe C. Balta, Kshitij Jain, Yikai Lin, Dawn Tilbury, Kira Barton, and Z. Morley Mao, Production as a Service: A Centralized Framework for Small Batch Manufacturing, *Proceedings of 13th Conference on Automation Science and Engineering (CASE), 2017*.

Matthew Porter, Vikram Raghavan, Yikai Lin, and Z. Morley Mao, Production as a Service: Optimizing Utilization in Manufacturing Systems, *Proceedings of Dynamic Systems and Control Conference (DSCC), 2016*.

TALKS

Pausing and Resuming Network Flows using Programmable Buffers

- 4th ACM SIGCOMM Symposium on SDN Research (SOSR), Los Angeles 03/2018
- CSE Honors Competition, University of Michigan, Ann Arbor, 10/2018

PROJECTS

Generic and Modular Traffic Migration 06/2018 - present

- Design a generic traffic migration abstraction for different network functions and applications (Change Management, Scaling, Disaster Recovery, etc)
- Design primitive modules for customizing traffic migration workflows
- Design unified APIs to allow vendors to plug-and-play their proprietary modules into the traffic migration workflows
- Design a mask-based abstraction for configurations to enable reversible and interleaving operations

An Application-Centric and Data-Driven Controller 09/2018 - present

- Propose a novel controller architecture based on a data-driven model instead of the common event-driven model
- Design an efficient mechanism for applications to express their interests in data while preventing redundant data retrieval
- Design a southbound interface using key-value schema that unifies data format across devices and decouples controller modules and applications from devices
- Design a northbound interface that exposes available data instead of capabilities to applications for portability and application-defined actions

Pausing and resuming network flows using programmable buffers 06/2016 - 09/2017

- Introduced new programming abstractions on SDN control plane to manage the buffering capabilities of programmable switches
- Designed a set of primitive APIs to orchestrate the flow buffering behaviors on programmable switches
- Implemented data plane utilities to enable SDN switches with programmable flow buffering capabilities
- Showed huge performance improvement using the new abstractions and APIs for mobility in LTE and 5G, and asynchronous communications between IoT devices

Inter-domain routing in SDN 03/2014 - 06/2015

- Deployed a West-East Bridge (WE-Bridge) testbed which interconnects several SDN domains including Tsinghua University, CSTNET, Internet2, SURFNet and BUPT (Demonstrated at CANS 2014, highly praised by Stephen Wolff)
- Designed and implemented service specific, fine-grained inter-domain routing applications in Java that run on WE-Bridge testbed
- Designed compression algorithms with Bloom-Filters to solve flow table explosion problems in SDN inter-domain fine-grained routing

Virtual network embedding 05/2013 - 05/2014

- Studied virtual network embedding using multi-objective linear programming, and designed algorithms to balance overhead, resource utilization and revenue
- Designed an artificial immune system based algorithm in C++ that resolved the conflict for ISPs to increase revenues while restricting energy consumption
- Created new data structures to implement antibodies and communities, and improved algorithm performance by adding self-adaptive dynamic factors

WORK EXPERIENCE

Research Intern 06/2018 - 08/2018
AT&T Labs Research, Bedminster, NJ

Research Intern 06/2016 - 09/2016
Huawei R&D, Santa Clara, CA

Graduate Student Instructor 09/2018 - 12/2018
EECS 281 "Data Structures and Algorithms", University of Michigan, Ann Arbor, MI

Graduate Student Research Assistant, with Professor Z. Morley Mao 08/2015 - present
Robustnet Lab, University of Michigan, Ann Arbor, MI

Undergraduate Student Research Assistant, with Professor Jun Bi 03/2014 - 06/2015
National Lab for Information Science and Technology, Tsinghua University, Beijing, China

PROFESSIONAL ACTIVITIES

Reviewer
IEEE Journal on Selected Areas in Communications

SKILLS

Programming: C++, Python, C, Java, Bash, JavaScript, MATLAB, GLPK/GMPL
Tools: OVS, Mininet, Docker, Vagrant, Ryu, Floodlight, ONAP, BESS, Wireshark, Git, Vim
Languages: English(native), Mandarin(native), Cantonese(native)

HONORS & AWARDS

NSF Travel Grant, ONAP Summit, USA 2018
Rackham Conference Travel Grant, University of Michigan, USA 2018
National Scholarship (top 1%), Ministry of Education, China 2012
First Class Scholarship (top 1.5%), BUPT, China 2013, 2014
2nd Prize, the Chinese Mathematics Competitions, Ministry of Education, China 2013
1st Prize, Mathematical Contest in Modeling, Ministry of Education, China 2013
Grand Prize, National English Contest, Ministry of Education, China 2013